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Report on the Progress of the Magnetic Survey, and of the Researches connected with it, from November 1855 *to April* 1856.—*By* Adolphe Schlagintweit.

Outline of the Route.

I left Mussoorie in company with my brother, Robert Schlagintweit, on the 9th of November. After staying some days at Dehra, we proceeded *viâ* Roorkee to Agra, where we arrived on the 21st of November.

We left Agra on the 29th of November, and proceeded *viâ* Gwalior and Tehri to Saugor (14th to 19th December.) I separated at Saugor from my brother Robert, and went *viâ* Dumoh to Jubbulpore (23rd to 27th December,) and after examining the interesting geological structure of the Nerbudda valley, I proceeded to Nagpore across the elevated district of Seuni, which separates the Nerbudda from Berar.

From Nagpore I travelled *viâ* Chandra and Badrachellum along the Godavery valley to the sea-coast near Rajahmundry, where I arrived on the 1st of February. The latter road was especially selected for the purpose of tracing the sand-stone of the Nagpore territory down the Godavery to the Eastern Ghauts, and of examining personally the fossiliferous localities of Kota on the Pranteta and of Rajahmundry. I went through the Godavery Delta to Cocanada, and thence by sea to Madras. (Arrived at Madras 19th February.) I left Madras on the 24th and proceeded

to the districts of Pondicherry, South Arcot, and Trichinopoly, to examine the interesting cretaceous strata, which yielded a considerable number of fossil remains from different localities.

From Trichinopoly I went up by the Coonoor Ghaut to the Neilgherries, where I stayed from the 10th to the 17th of March.

I returned *vid* Mysore and Bangalore to Madras; I left Madras for Calcutta by Steamer on the 1st of April, and I reached Simla on the 26th of April.

I was accompanied during the operations of this cold season by my draftsman, Eleazar Daniel, a guide in the Quarter Master General's Department, and I beg to bring to the notice of Government the very useful services rendered to me by this man in the prosecution of my researches, both during this season and previously in the Himalayas, and on the march from Bombay to Madras in 1855.

The geological and paleontological collection made during this season (eighteen boxes) have been forwarded to England through the Government of Madras.

Magnetic Observations.

Complete magnetic observations have been made on the following Stations:—

Agra.
Saugor.
Dumoh.
Jubbulpore.
Nagri, South of Nagpore.
Bibberi, between Chandra and Badrachellum (Magnetic dip only.)
Rajahmundry.
Cocanada (Declination only.)
Pondicherry (Dip only.)
Ootatoor, near Trichinopoly.
Ootacamund on the Neilgherry Hills.
Bangalore (Dip only.)

At Madras, the magnetic force of my needles was compared with the magnets of the Observatory; my needles were the same which had been compared with the Observatory needles in February

1855; and these comparisons will facilitate in a great measure the determination of the absolute values of the magnetic force for the different stations of observations.

All the magnetic instruments have remained in perfectly good order throughout the season.

My brother and myself had wished to subjoin to this Report a more elaborate *resumè* of the results of the magnetic observations now extending over a pretty considerable part of India, together with a map showing the magnetic curves; but we found such a work, with any attempt at the necessary accuracy, would have taken at least one or two months; so great an interruption of our movements would have necessitated a complete alteration of the plan of our operations during the ensuing season, and it would have been probably quite impossible to extend our researches for the present year into the most distant parts of the Western Himalayas.

Every one acquainted with the details connected with the final reduction and calculation of scientific data, like magnetic and other physical observations, will agree that it is quite useless to publish, in a hurry, provisional figures and results, which would all have to be cancelled and re-calculated for the final computation of the work.

We expect, if no unforeseen accident interrupts our progress, to be able to return to Europe in one year and a half, and we shall then endeavour to reduce and publish the results of our magnetic and other researches with the greatest regard to the accuracy necessary for final results, which may perhaps not prove quite unworthy of the patronage bestowed upon our scientific researches by the Court of Directors.

As a general result of our magnetic observations, I mention the fact, that the magnetic intensity increases in India from the South towards the North much more rapidly than might be expected from a consideration of the geographical latitude only. If the curves of the dip of the needle are laid down on a map, it is plainly seen that the spaces between them are very narrow when compared with other parts of the world.

Thus, in North West India, in a latitude of 30 and 31½ degrees, the dip of the needle is already as much as from 41 to 43 degrees.

I subjoin a list of the dip for some of the more important of my magnetic stations: several needles were used for the observations at the principal stations: —

Names of Stations.	*Magnetic Dip.*		
Ussilla, on the Tonse River, in Gurhwal, in the Himalayas,	42°	56′	4
Mana, in Gurhwal, in the Himalayas,	42	32	
Milum, in Kumaon, (Himalayas,)	41	4	
Mussoorie,	41	14	8
Simlah,	42	25	22
Nainee Tal in Kumaon,	38	37	
Saugor,	29	52	
Jubbulpore,	28	28	
Nagri, South of Nagpore,	22	38	
Rajahmundry,	16	16	
Madras, (1855 February,)	7	38	
Ootacamund, Neilgherries,	4	14	
Ootatoor, near Trichinopoly, in Southern India,	2	35	30

The magnetic dips observed by my brother, Hermann Schlagintweit, in the Eastern Himalayas and in Assam, agree very well with the results obtained by me in North-Western India, and they also show a very great dip of the needle.

The magnetic declination in the Himalayas of Kumaon and Gurhwal, visited in 1855, was every where Easterly varying from $3\frac{1}{2}$ to 4 degrees.

The declination continued constantly to be to the Eastward along the route which I followed during the cold season from Agra to Rajahmundry and from Madras to the Neilgherries. The line which separates the Westerly declination of the Western Coast of Bombay from the country with Easterly declination lay to the West of the route followed. At the Neilgherries the declination was still Easterly, amounting to 53′ 30″ East.

Meteorological Observations.

The observations of the barometer and thermometer, &c., have been carried on, as before, regularly every day, and the height of all the important places on the march from Agra to Rajahmundry,

and from Madras *viâ* Trichinopoly to the Neilgherries and back, have been determined by repeated barometric and hypsometric observations.

Particular attention was paid throughout this season to the temperature of the ground at various depths below the surface.

We have been fortunate enough to obtain very regular and careful observations of the temperature of the ground from the surface down to a depth of two metres (6½ feet) for the last twelve months from Madras and Calcutta. They were made at Madras under the superintendence of Major Worcester and of Major Jacob, and at Calcutta under the superintendence of Major Thuillier: the instruments used were brought out by us, were similar to those used by ourselves, and had been all carefully compared.

This will enable us to correct our own observations, made at various stations for the changes of temperature taking place from one month to another, and to make them all strictly comparable by reference to one common standard.

Our observations show that great confidence may be placed in the temperature of the ground, ascertained thus directly by thermometers buried at different depths below the surface, and the results for the decrease of the temperature, with height calculated from different stations, agree remarkably well. It seems that the temperature of springs is more liable to be effected by local causes connected with their mode of origin, &c. than the temperature of the dry ground, thus ascertained directly.

The following Table shows the temperature of the ground at some of my stations, where observations have been conducted for some time, in various localities :—

Temperature of the Ground at 2 metres (6½ feet) below the surface at some Stations between Agra and the Neilgherries.

	Temperature. centigrade.
Agra, 23rd February to 4th March, 1856, ...	23° 5′
Jubbulpore, 22nd to 27th December, 1855, ...	22 8
Sitabuldee, near Nagpore, 3rd to 9th January, 1856,.....	28 6

The temperature of the ground in the plains about Nag-

pore, which are so remarkable for their excessive summer heat, is very high, when compared with the stations in the more elevated districts of the Nerbudda and of Bundelkund.

Chandra, South-East of Nagpore, 14th to 16th January, 29 0

Rajahmundry, at the head of the Godavery Delta, 2nd to 8th February, ... 29 8

Cocanada, East of Rajahmundry, on the sea-coast, ... 29 6

The observations were made in three quite different localities, which gave 29° 5′ C., 29° 7′ C., and 29° 6′ C. The temperature of the ground is a little colder than at Rajahmundry, though Cocanada is 40 E. F. lower than the other place, on account of the great humidity of the sandy deposits in the lower parts of the Godavery Delta.

Trichinopoly, South of Madras, March 7th to 8th,..... ... 29 9

Ootacamund, on the Neilgherry Hills, March 12th to 17th, 18 8

A fine spring near the Ootacamund Church was, ... 18 0

Madras, March 19th to 24th, ... 29 8

If the temperature at Ootacamund (7410 E. F.—my place of observations) is compared either with Trichinopoly or with Madras, the decrease of the temperature of the ground for 1 degree C. corresponds to an elevation of from 660 to 670 E. F. A fine spring on the slopes of the Neilgherries, when compared with Trichinopoly, indicates even a more rapid decrease of temperature, 1 degree C. corresponding only to an elevation of 600 to 640 E. F.; and it seems quite certain that the decrease of the temperature of the ground on the isolated Neilgherry Hills is more rapid than in the Himalayas, where we formerly found an elevation of 720 E. F. to correspond to a decrease of the temperature of 1 degree C.

The observations on the temperature, velocity and quantity of water, &c., of various rivers, have been continued throughout the journey, and we think that these observations, when properly compared and worked out, may be not without some interest, both in reference to Meteorology and to Geology.

The temperature and quantity of water of springs has also been ascertained as often as opportunities would present themselves.

I had the opportunity of visiting an interesting hot spring on the Godavery, near Badrachellum, in the Eastern Ghauts, to the West of Rajahmundry.

It is situated in the sandy bed of the Godavery, about 3 miles from Badrachellum.

The water does not come to the surface, but is concealed under the alluvial sand which fills up the dry bed of the Godavery River. I met it after having dug a well of 7 feet depth. The highest temperature observed was 49 degrees C., but of course the temperature is much affected by the cold water of the Godavery constantly percolating through the sand. The presence of the hot springs is said to be visible during the rainy season, when the Godavery fills up its whole bed by some vapour of water rising just over the spot where the hot spring is situated. During the dry season the presence of the hot water under the sand is clearly indicated by the high temperature of the sands above it, which, at a depth of from 15 to 20 centimetres from the surface, had a temperature of from 36° to 38° centigrade. The heating influence of the spring upon the surface sands extends over as much as 200 to 240 square metres.

Its origin is certainly due to one of the great fissures of dislocation or faults which have accompanied the upheavement of the Eastern Ghauts, though in the immediate neighbourhood no peculiar alteration in the general features of the country is visible.

Geology.

The great surface of the country which I was able to traverse during this cold season offered a very favourable opportunity for geological observations.

I shall endeavour, in a few paragraphs, to mention some of the conclusions to which I think my observations will lead, but I must reserve it for some later period to illustrate these statements with the necessary detailed sections and notes.

1. The sandy deposits of the plains of Hindustan, which are bordered by the Himalayas and by the mountains of Bundelkund,

are not a deposit by rivers, but a deposit in a large basin of water, which very probably was fresh water; they are in no way to be considered as fluviatile deposits by the Ganges or Jumna; the material for their formation has been brought down from the Himalayas as well as from the ranges of Bundelkund, and I am quite convinced that the very extensive denudation and excavation of the sand-stone ranges of Bundelkund, Gwalior, &c., has contributed in a very considerable degree to the formation of the deposits in the plains of Hindustan.

The formation of *kunker* is evidently generally due to a process of segregation of the whole deposit, but besides this concretionary *kunker*, there occurs in some places a different formation of *black kunker*, which extends horizontally sometimes to very great distances; it occurs not very far below the surface and is generally merely covered by drifted sands; its origin has been connected with the drying up of old lakes (jheels) similar to those found at present in some parts of Hindustan.

2. To the Southward of Agra, in Bundelkund and Gwalior, occurs a formation of sand-stone with shales absolutely identical with similar rocks, which cover a great extent of surface in India.

I shall venture to offer a few general remarks upon these rocks. The formation occurs in Bundelkund, in various parts of the environs of the Nerbudda valley, in many places of the Nagpore territory, and in the Eastern Ghauts throughout their extent: it is there apparent in parts in extensive masses as in the Cuddapah, Bangapilly, and Kurnool districts. In other places only occasional masses or strips of sand-stone shales are met with, and the formation has been broken up and destroyed to a great extent by the granitic outbreak of the Ghauts. The formation can be traced, though often interrupted by the granitic masses in the Eastern Ghauts, to the south of Madras.

I met sand-stones and marls undoubtedly identical with the Nagpore rocks and containing faint vegetable remains as Streperматoor, 30 miles west of Madras, on the Bangalore road, where they crop out in some places around the tank.

Another interesting locality which I had the opportunity of visiting was at Trivacery or Teruvacery, a village 18 miles west of Pondi-

cherry. The sand-stone of Trivacery is absolutely identical in all petrographical characters with many specimens from the Nagpore territory; it also contained many fossil trees, which I am convinced will prove the same as those found in some places of the Nagpore territory, as well as near Raneegunge to the west of Burdwan and Calcutta.

I think that the coal-bearing strata of Raneegunge, in the hills west of Calcutta, belong to the same formation with the rest of the above quoted localities.

Whether the lime-stone and shales of Kulladghee, which I had occasion to investigate in the cold season of 1854-55, constitute a formation different from the above or not, I am unable to say at present, from want of my journals and specimens, which have been all sent away.

The character of this extensive formation of sand-stones and shales varies considerably; generally the sand-stones can be well distinguished from the underlying shales.

In some localities the distinct stratification is clearly visible, and the sand-stones, more or less horizontal, repose contrary to the ordinary laws of conformity, upon the out-crop of the inclined shales underneath: this is the case in the Gwalior territory, in Bangapilly, Cuddapah, &c.

In other districts, for instance at Nagpore, near Chanda, and on the Pranheeta, the marly slates and sandstone seem to lie conformably, and have both been subject apparently to the same bendings and foldings.

But though the characters of the rock are very variable, it is nearly always possible to trace the one variety into the other; occasionally the mere lithological resemblance, even between very distant points of the formation, is very striking.

Fossil remains have been found in several places; the best known locality is at present the Nagpore territory, where the persevering researches of the Reverend R. Hislop have brought to light a rich collection of fossil plants and several very interesting animal remains.

I have much pleasure in acknowledging my obligations to Mr.

Hislop, who was kind enough to give me every assistance and information during my stay at Nagpore.

I met fossil wood and some fragments of fossil bones in several places along the Godavery. Near the junction of the latter river with the Pranheeta, at Kota, near Shironcha, are found very curious remains of fossil fishes and reptiles connected with a thin bed of coal. These fossils were first discovered by the late Drs. Bell and Walker, and I trust that the collection which I was enabled to make in this locality may not prove without some interest even after the very fine specimens sent to England by the two above-mentioned gentlemen.

Vegetable remains can be traced in many places in the sandstones and marls, though the appearance is often very much changed. Leaves, together with fossil wood, were met with in the Eastern Ghauts on the Godavery and at Trivacery, 18 miles west of Pondicherry.

It seems that the formation has been deposited throughout in fresh-water lakes, but it would be premature to express at present positive opinion on the geological age of the formation. It appears from some fossil remains that it may be oolitic; but only a close enumeration and comparison of all the fossils hitherto collected and brought to Europe will be able to decide this question.

With reference to the difficult question of the age of the sandstone formation, it is worth mentioning that I have seen the sandstone, with fossil trees, clearly overlaid by the cretaceous strata in the Pondicherry district, so that it cannot be younger than Jurassic.

The existence of coal in this formation is connected with the vegetable remains, which as I have mentioned can be traced in many places. The coal-seams are generally not of great thickness, and the coal is in most places impure, but larger seams have been found in some localities, in Burdwan, the Palamow Hills, the Nerbudda Valley, &c., some of which are worked pretty extensively.

3. The great trap formation of the Deccan has been visited during this season on its Eastern borders. I have been able to examine the fresh-water strata interposed between the trap layers in many localities, and I have traced the continuation of this thin

fresh-water stratum containing only fresh water-shells (Physa, Melania, Unio, &c.) down the Godavery to Rajahmundry. Near this place occurs a very curious mixture of the unmistakeable fresh-water Physa Prinsepii, with numerous true marine species.

The lime-stone stratum, with these marine shells, lies like the fresh-water lime-stone of the Deccan between a mass of trap (Dolerite); it reposes upon a cellular trap, and is covered by upwards of 50 feet of nodular trap. It is found at Cateroo, 3 miles from Rajahmundry, and at the Pangadi Hills, 10 miles from the latter place, and is from 2 to $2\frac{1}{2}$ feet thick. In some places the rock is quite full of marine shells, which belong to Arca, Cardium, Venus, Cerithium, Turbinella, &c. I also found a large well-preserved nautilus at Pangadi, which will serve to throw some light upon the age of the intertrapian lacustrine and marine formation of India.

The connection between these strata of Rajahmundry and the merely fresh-water deposits of the Deccan is quite clear; it seems to have been a deposit probably in a series of great lakes growing brackish to the Eastward. The fresh-water Physa Prinsepii, not to be distinguished from the Deccan specimens, lies side by side with Cerithium, Arca, and other marine shells.

The fresh-water intertrapian stratum of the Deccan is from 2 to 4 feet thick; it consists in part of variously coloured marls, in part of impure lime-stone.

In the parts where I had the opportunity of examining it, near Saugor, near Lenni, Nagpore, &c., it generally is covered by globular black trap of from 40 to 70 feet thick only, which seems to have been the most recent of the trap effusions in this part of the country. It rests upon a cellular Amygdaloid or Wacke, into which it sometimes graduates, so as to make it impossible to draw any distinct line of separation between the two rocks. I also observed frequently quite isolated patches of a very soft cellular Wacke between the fresh-water strata themselves. It seems to me that the fresh-water strata have been deposited at the bottom of lakes covered with volcanic ashes, and it is quite probable that occasional showers of ashes still fell occasionally during the period of the

formation of the calcareous and marly deposit at the bottom of the lakes.*

Another interesting phenomenon connected with the intertrapian formation is the very regular and horizontal outline shown by the thin line of the sedimentary stratum on the exposed sides of the hills; and the fact, that though no bending or contortion of the stratum is visible, it may be found at a much higher or lower level on one of the next hills. From a careful examination of the localities, I think that this fact can only be due to the existence of extensive faults and to phenomena of subsidence and elevation of whole mountains *en masse* caused by them. Of the existence of such faults, evident proofs can be found in many localities.

I finally wish to mention, that the intertrapian lacustrine formation is not confined to the borders of the grand trap mass, but that it can be traced, though often altered and scarcely recognizable, to a great distance to the Westward in the interior of the trap mass.

4. On the road from Madras to Trichinopoly I had an opportunity of examining the cretaceous formation, which seems to be entirely limited to this part of India.

The cretaceous strata cover in these districts an extensive surface of country, and the fossil remains are found scattered throughout the formation in many localities. Assisted by my draftsman, Eleazar, and some other of my men, who have now been instructed in collecting similar objects, I have been able to obtain a pretty fine and extensive collection of the cretaceous fossils from very various localities. The whole of the strata from the Pondicherry district down to the most South-Western localities in the Trichinopoly district (circumference 120 miles) belong to the same formation; the rocks are quite the same and the fossil remains are nearly identical.

* I mentioned in the first Report for the cold season of 1854-55, that the effusion of the trap in the Deccan had taken place under heavy pressure, probably of sea-water. I now beg to say that it is much more probable that the effusion has taken place at the bottom of extensive fresh-water lakes than at the bottom of the ocean.

There exist local accumulations of bivalve shells, constituting neally the whole mass of the rock, for instance at Garudamgalum, near Ootatoor (Trichinopoly district) where the rock is quarried, polished, and sold as "Trichinopoly Marble."

These accumulations may perhaps have been old sea beaches, but they do not constitute a separate or more recent formation than the strata with the ammonites. Close to the accumulations of bivalve shells occur strata containing large ammonites, some of $1\frac{1}{2}$ feet in diameter; and I even saw ammonites in the rock full of the bivalve shells.

The cretaceous strata seem to have been generally quite undisturbed; they repose horizontally upon the oolitic sand-stones at Trivacery and upon the crystalline schists in other localities.

The cretaceous strata are covered by a deposit of rolled pebbles, with red lateritic earth, which is evidently more modern and brought down at a former period by violent currents of water from the Eastern Ghauts.

The deposition of the cretaceous strata took place after the principal upheavement of the Eastern Ghauts, since these strata are nowhere seen to penetrate into the interior of the Ghauts or to the Mysore and Deccan plateaux, and since they have not been affected by the upheaving and disturbing agency, which must have accompanied the formation of the Ghaut Range.

5. During my visit to the Neilgherries and the Mysore, I was especially anxious to extend my observations in reference to the direction of faults and planes of foliation in the crystalline rocks of Southern India. My observations in various parts of India have convinced me, that the lines of faults and joints and of the direction of the planes of foliation and cleavage, when laid down upon maps, show many very striking coincidences with the main direction of mountain chains and rivers.

The following are the most important directions of fault and cleavage planes occurring in the Neilgherries and the Mysore plateau:—

1. From N. N. E. to S. S. W., which coincides with the mean direction of the Eastern Ghauts, where the cleavage planes run generally in this direction.

2. From S. S. W. to N. N. E., which is the line of the Western Ghauts. On the Neilgherries these two directions of disturbance actually meet. The former one is clearly represented by the direction of Eastern border of the Neilgherry plateau and by the Dodabetta range, the latter one by the fine mountain range of the Koondahs, which rise to the South and South-West of Ootacamund.

3. Lines of extensive faults are clearly traceable on the Mysore plateau, running from West to East. The direction of some of the principal rivers, as the Mayar, the Cavery, &c., is connected with them. Along the valley of the Mayar the fault is very clearly visible.

4. A fourth line of disturbance runs from North to South through the Mysore country. It is less marked by the direction of the planes of cleavage or foliation than by extensive dykes of greenstone and of a fine large-grained granite, which run in this direction often for many miles.

An Account of a Journey across the Chains of the Kuenluen, from Ladak to Khotan.—By Hermann *and* Robert Schlagintweit, Esqs.

Proceeding from Ladak through Nubra to the Pass of Karakorum, we were able to pass the frontier of Ladak and to extend our observations over very nearly the whole breadth of the Kuenluen mountains. We estimate (not having yet reduced our astronomical observations of latitudes and longitudes) that the distance we travelled in Turkistan before returning again into the Thibetan territory is very nearly 300 English miles.

We left Ladak July 24th, and went by the Laoche Pass (17,600 feet*) to the valley of the Shayok and to Nubra. From Nubra we crossed the Sassar Pass, about 17,500 feet. We stayed two days in the Pass itself to make Magnetic observations, and to enable us to reach the summit of the Sassarla, (Sassar mountain 20,000 feet) from which we had, as we anticipated, a very extensive and interesting view of the large groups of glaciers surrounding the Pass, one of the largest accumulation of glaciers in the Kuenluen.

* The heights given in this Report are only approximations. Very good corresponding observations were taken at Ladak, but we have not yet been able to calculate them in detail.

From the Sassar Pass, our route brought us to the large plateau to the south of Karakoram, the mean elevation of which reaches 17,100 feet. On the 9th of August, we crossed without any difficulty the frontier of Turkistan. We were accompanied by Mani, the Putwaree of Milum, by Makshoot, a former servant of Moorcroft's, and by Mahomed Amin, an aged Turkistaní, whom we found particularly useful on account of his general knowledge of the country. We had besides six horses for ourselves and servants, (the three men above mentioned,) thirteen horses for baggage, five Yarkandis, and some fifteen sheep and goats. The Yarkandis with horses and provisions we sent secretly on ahead, and we only met them, as by chance, in Nubra. Our servants from India accompanied us as far as Sassar, from whence we travelled dressed as Yarkandis. The day before we passed Karakorum, (18,300 feet) we met a large caravan of merchants from Yarkand, to whom we gave out that we intended to march on along the Yarkand road; but as soon as we had passed Karakorum, we left this road and went to the east, to Kissilkorum, (17,400 feet) the high water-shed between the Yarkand and the Karakash rivers. We crossed in one day four Passes, more than 17,000 feet above the level of the sea, but only slightly elevated above the surrounding plateaux.

We followed from Kissilkorum the direction of the principal chain of the Kuenluen, now turning to the south south-east, till we reached a lake, Kiúk-kiul, (*ú* like *oo* in wood; *u* like *u* in but) slightly salt, situated at the northern foot of the Changchenmo. Up to this point our route had chiefly led us over extensive plateaux, 16,000 to 17,000 feet above the level of the sea, of a much greater extent than those to the south of Karakorum; but from this lake we followed the valley of the Karakash river, to the right of which there are no plateaux, while to the left they extend as far as Suget.

The sterility of the plateau to the north of Karakorum, as well as of the Karakash valley, is quite surprising: without the frequent, though not very abundant, precipitation of snow, chiefly caused by the great elevation of the ridges, these plateaux would be complete deserts. In a march of eighteen miles, we only met with four species of plants; for many days grass was exceedingly scarce, while for several days we had absolutely none, the grass round the

Kiúk-kiul lake being the only exception. We had taken with us a small supply of gram, anticipating in some degree the sterility we met with, which saved our horses from absolute starvation. Nevertheless, they suffered dreadfully, the more so as the great scarcity of grass compelled us to make long marches of twenty to twenty-four miles a day. Close to the Kiúk-kiul we met with a very interesting group of more than fifty hot springs, chiefly containing muriate of soda (common salt), and a great quantity of carbonic acid. The temperature varied from 25° to 49° C. = 77° to 120° Fahrenheit.

We had already met in the valley of the Nubra with two other groups, the one near Panamick, (hottest spring, 78.1°=172.6° Fahrenheit); the other near Changlung, (74.1° C. = 165.4° Fahrenheit). After a march of seventy miles in four days, we came to Súmgal, where a route branches off to the valley of Bushia, and to Elchi the capital of Khotan.

Before reaching Súmgal we had nearly lost our road. Mahomed Amin, who generally accompanied us, had gone in front, whilst we were engaged in measuring the breadth of the river and the depth of its erosion. We saw him distinctly with our telescope on the other side of it, and followed his and his horse's foot-prints until six P. M., when they again crossed the water. But our people being behind us, we turned back to meet them; but no trace of them was found, as they had evidently also lost their way and had kept on the wrong bank of the river: we again tried, it being now eight o'clock P. M., to cross the river, which is here divided into many branches, but were overtaken in the middle by nightfall, and were obliged to stop on a low mud bank. Our first care was to secure our two horses, fastening their legs with the straps of our sextant and our prismatic compass. We now observed, on a little Myricaria stem close to our resting-place, that the water was gradually rising from the melting of a late fall of snow. Fortunately the great breadth of the river secured our bank from being overflowed, though the moisture of the ground was rapidly increasing.

The next day, August the 20th, we found our people in the afternoon, and Amin at Súmgal in the evening; our horses had suffered so much from fatigue as well as from scarcity of food, that on the

way from Kissilkorum to Súmgal we lost seven out of nineteen. From Súmgal a road branches off, as mentioned above, to Bushia and Elchi, and as there was some hope of procuring at these places fresh horses, or Yâks, as well as food, our men were easily persuaded to proceed in this direction.

We started August 22nd, with only two laden horses; we had to cross a glacier Pass, 17,000 feet. At ten A. M. we were overtaken by a violent snow-storm, lasting till six P. M. The road was extremely difficult for the horses, on account of a number of fissures in the glacier. When we had gone some little distance farther, our people finding it impossible to follow with the laden horses left every thing behind—tent, blankets, and a small trunk containing merchandise, money,* and instruments, (the most necessary ones we happily carried ourselves on the ice,) taking only a little food with them; but even then they followed so slowly, that they were unable to cross the last terminal moraine of the glacier before nightfall. We were compelled in consequence to be in the snow all night in our wet clothes. The snow had ceased falling, but the cold was still so very great, (11.4° C. = 11.5° Fahrenheit) that two of our horses died from it during the night; one on the glacier with our people, and the other at our feet.

In Bushia, which we reached two days later, on the 25th of August, we met with a very cordial reception from the inhabitants, and got horses, yâks, sheep, provisions, &c., promising to pay for them in Súmgal. These people, half-nomadic Tartars, seemed very honest, and the prices they asked were very moderate. They inhabit caves fitted up like houses in the cold season, and tents during the rest of the year.

The height of Bushia is 9,200 feet. We dressed like the inhabitants, and had also learned the necessary forms of salutation. The people here are far from being savages, but on the contrary very ceremonious. They took us, never having seen any Europeans, for what we represented ourselves to be—merchants from Delhi. Elchi, the capital of Khotan, was only distant two days' journey; but we found the people very reluctant to accompany us there, for

* We used very little money, but chiefly goods, rich Indian cloth, for barter.

they feared the Chinese soldiers stationed not far from Bushia; besides the time was far advanced for our intended researches in Cashmere. The distance from the Northern foot of the Kuenluen was one and a half day's journey; already at Bushia the Alpine character of the Central Kuenluen had disappeared, the height of the summits in the environs of Bushia not exceeding 11,000 feet. We left Súmgal August the 29th, and followed for three marches the valley of the Karakash, which flows from Súmgal to Suget in a westerly direction, then takes a sharp turn to the north, and from thence flows for the most part in an east north-easterly direction.

We met on this road with very large quarries and mines, from which is dug the Yashem stone (the Fahde), and which are resorted to by people living at great distances. We were enabled to procure for future analysis a good supply of the different varieties of this stone, which is much valued throughout Central Asia. Suget, a halting-place on the winter road to Yarkand, is six ordinary marches distant from Karakorum. From Suget to Karakash, another town of Khotan, is six marches. We started after due deliberation on the 1st of September with Mahomed Amin and only two laden horses, leaving our fresh horses and every thing else we could do without, including our little tent. Some instruments, blankets, furs and provisions were all our baggage. We succeeded in making in twelve days about 220 English miles across the central parts of the Kuenluen, (twenty-five marches of the Russian itinerary route from Yarkand to Leh). We reached Leh in the evening of the 12th September. This river, as well as the other streams descending from the northern slope of the Kuenluen, disappears entirely after a short course in the sandy plains surrounding lake Lop.

The country between Suget and the Karakorum was new to us. We had here a very good opportunity of examining and determining the mean elevation of the plateau above mentioned. We also had, before we reached the Pass, a very extensive view of the highest central peaks, which we tried to draw in the scale of one degree = one centimetre in length.

From this point we wished to follow the Shayok river, as this route would have taken us through a country new to us. We also

met amongst many others a caravan with fourteen camels (the Camelus Bactrianus) with two humps, frequently used for carrying loads on the Yarkand road; these stout animals constantly cross the elevated crests on the Yarkand road up to 18,000 feet, and seem apparently little affected by the cold of these heights, the native climate of wild Yâks and Kiangs.

We succeeded in procuring two of them, remarkably tame animals, expecting to find them particularly useful in crossing the frequent rapids met with in the Shayok river. But notwithstanding the height and power of these animals, we found it impossible to go down the Shayok Valley. The river had much subsided, compared with its height when we crossed it near Kardong, in the beginning of August; but it was still far from passable, (which it is from the end of October to the end of March). We were obliged therefore to leave the road down the Shayok Valley at Súltan Chúskúl, to go up the Valley to Sassar, and follow from thence our old route. We had to cross in one day, not without difficulty, the Shayok river five times before we reached Sassar.

During our absence from Leh, our Native Doctor Hurkishen had made meteorological observations, and what was especially valuable to us, detailed Barometric and Magnetic observations. He had completed a plan of Leh, the chief points of which had been laid down before our departure, and collectors had been sent to different parts of Ladak to complete Geological and Botanical collections, particularly with reference to geographical distribution: we found all our orders had been very carefully executed.

Our horses and luggage left behind at Suget, not arriving for thirteen days after us, (September 25th,) we had time, besides finishing our plans and drawings, to take numerous casts in plaster of Paris* of the different tribes, as we had already done in other parts of India and the Himalayas. The variety of tribes which is to be found in Leh is particularly great, on account of its extended trade with the different parts of Central Asia.

* We are obliged to E. H. Longden, Esq., Superintendent of the *Secundra Press* at Agra, for a very valuable supply of plaster of Paris, when our own stock was nearly exhausted.

General Remarks on the Observations made during the Journey, from Ladak to Khotan.

Magnetic Observations.

In Leh, two complete series of Magnetic observations had been made before our departure, and two Magnetic apparatus had been put up during our absence, one for the observation of the daily variation of the declination, another for the daily variation of the horizontal intensity. Observations were taken six times a day by our Native Doctor Hurkishen the whole time we were absent. During our journey to Turkistan we had with us a Declinometer, a Vibration Apparatus, and a Dipcircle. We took observations on the Sassar Pass, on Karakorum, in Sumgal, and in Suget. The mean of the declination at Leh was, from July to September, very near 2° 44′ East. The declination decreased on the points above mentioned, and was in Suget 2° 12′ East.

The mean for the inclination was—

At Leh, M.....	46°	50′	20″
On Sassar Pass,.....	48	11	75
On Karakorum Pass, ...	49	8	0
In Sumgal,.....	50	1	3
In Suget, ...	50	4	5

Geographical Remarks.

Extensive plateaux are to be found on both sides of Karakorum, being most extensive to the north and west of the Pass. Eastward the plateaux terminate completely in the longitude of Changchenmo, where we met again with valleys and ridges, both well defined. A similar succession of ridges and valleys is also the principal character of Ladak, where plateaux are generally not met with. The mean height of the plateau to the north and west of Karakorum is from 16,800 to 17,000 feet. The point where the plateaux reach the greatest mean elevation, probably the loftiest plateau in the world, is a little to the north of the sources of the Shayok. To the south of this region between Karakorum and the Nubra Valley, a second region of a great general elevation was found, in which some single peaks seem to attain the greatest absolute height. We had an opportunity of measuring some peaks one of which was 24,000 feet.

The mean direction of the principal crest of the Kuenluen which forms the water-shed between Ladak and Turkistan, runs north-west to south-east from the sources of the Yarkand river to Rudok. Another more northern chain independent of this, and of a comparatively smaller elevation, runs from west to east; this is the chain over which Passes lead from Bushia and Elchi to Yurunkash, Keria, &c. The fall of the upper portion of the rivers Yarkand Deriao and Karakash Deriao is not great. But the rivers descending from the other ridge, which runs from west to east, have a much more rapid descent, particularly the rivers on the northern side of this ridge.

We succeeded in procuring, besides our own routes, itineraries of the commercial routes to Badakshan, Yarkand, Kashgar, Kokand and to Aksu, from the different caravans we met with. The information thus obtained from independent sources was very consistent as regarded the number and succession of the halting-places and their distances from each other. It is scarcely necessary to add that we found Baron Humboldt's "Map of the Mountain Systems and the Volcanoes of Central Asia" of the greatest assistance in making our own observations and in prosecuting enquiries for routes.

Geology.

To the north of the Nubra Valley much lime (chiefly carbonate, combined with large masses of sulphate of lime) is met with; but alternating in such a manner with crystalline rocks, that it can scarcely be thought to be sedimentary; it also appears nowhere to contain fossil remains. On the northern margin of the Kuenluen, crystalline rocks appear to extend to the foot of the mountains, and if a margin of sedimentary rocks exists, it can only be very narrow.

We very often met with a hard crystalline rock, not unlike pudding stone, which contained enclosures of spherical and angular forms. We also came to quarries, where the Yashem stone is dug; they are at Gulbagashen in the valley of Karakash. We took a good quantity of the best specimens with us for future analysis.

Two systems of cleavage predominate, which are particularly regular in the central parts of the Kuenluen: the steeper one dips North 30° to 50° East, the other South 20 to 40° West.

The erosion is very deep in the valleys on the northern margin of the Kuenluen. In the inner parts of the Kuenluen, the valleys present for the most part a Thibetan character, displaying a broad basis slightly inclined, over which the water spreads itself in many channels, and afterwards evaporates completely.

Extensive glaciers are chiefly met with in the range to the north of Karakorum, (*i. e.* in the ridge above mentioned in a direction from west to east,) and another group, apparently the largest accumulation of glaciers in the Kuenluen, was found in the environs of Sassar, but both much smaller than the groups near the Diamer, to the north-west, investigated by our brother Adolphe.

Two fine groups of hot springs of analogous character, (both depositing great quantities of lime, and smelling slightly of hydrosulphuric gas) were found in Nubra. The temperature of the hottest springs of the group near Panamick was 78° C. = 172.6° Fahr.; of the other group near Changlung, 74.1° C. = 165.4° Fahr. A spring of ordinary water at the same height as Changlung had a temperature of 10.1° C. = 50.2° Fahr. There is another group of hot springs mentioned above, situated a little below the lake Kiúk-kiul, (14,800 feet). Their deposits are nearly pure muriate of soda. These springs, more than fifty in number, are partly situated in the very bed of the river Karakash, and surrounded closely by its cold waters. The temperature of these springs is from 25° to 49° C. = 77° to 120° Fahrenheit.

In these neighbourhoods, and also lower down in the Karakash Valley, are found several groups of salt pools, conical depressions of the ground filled with solid salt and a concentrated solution of salt. The salt was nearly pure table salt; but some pools were not yet so far advanced in the progress of concentration that solid salt had deposited itself.

The high temperature of these salt pools was very remarkable. The salt deposit forms a stratum over the excavation containing the salt-water and a nearly complete cover on its surface. The great diathermaneity of salt (a stratum of salt allows 92 out of 100 thermic rays to pass through it, while an equal thickness of glass only allows 39,) is the principal cause of the excess of temperature In consequence of this physical property of the salt, the tempera-

ture of the water below the cover is considerably raised by insolation during the day, whilst it loses little heat by nocturnal radiation, (a phenomenon of accumulated heat analogous to that of Saussure's and Sir John Herschel's Heliothermometers). In the salt pools the loss of heat by noctural radiation is still more lessened by a circumstance peculiar to perfectly concentrated saline solutions, namely, that all the little openings in the superficial salt cover which exist during the day, are closed by a deposit of solid salt as soon as the temperature begins to fall in the evening. In the lower strata of the water contained in those conical reservoirs the temperature decreases very rapidly, a phenomenon which seems perfectly to agree with the explanation given above, but to exclude the supposition that the temperature is raised by heat having its origin in the lower strata of the ground, as is the case in hot springs. Besides, artificial salt pools were constructed immediately after our return to Leh, and we used the materials, (salt and clay) which we had brought for this purpose from the salt pools in the Karakash Valley. The variation of temperature in these artificial salt pools was observed from hour to hour, and these observations equally showed that the excess of temperature only begins after the formation of a solid stratum of salt, which more or less closes up the surface of the pools.

Meteorology.

The snow line (the highest summer limit of perpetual snow), was found to attain the greatest height in the environs of Karakorum, its height exceeding 18,600 feet. The snow line sinks very little towards Leh, but considerably on the northern slopes of the mountains towards Khotan. Near Oitash, above Bushia, we found its height not exceeding 16,000 feet.

Bas-Névés completely hidden under detritus, a sort of subterranean glaciers, but generally speaking of limited extent, which we had seen first on the slopes descending from the Parang Pass, occurred again in the Kuenluen on the northern slopes of the Sassar mountains. In this group, which we crossed twice, we had an opportunity of determining the variation of the snow line. In the middle of September it had already sensibly descended, whilst the

isolated low snow beds in protected places and the subterranean Bas-Névés above mentioned had, comparatively speaking, very much diminished by the melting which still continued in the lower parts of the slopes and valleys.

The dryness of the atmosphere appears to be greatest in the environs of Karakorum, but it rapidly decreases in the direction of Khotan. From various and apparently very consistent data, which we obtained from the inhabitants we estimate ..... inches.

The direction of the wind is chiefly northerly. The south winds which predominate in Central Ladak and in Kunawer are perfectly unknown on the northern side of the Kuenluen.

The phenomenon of the second illumination of snow-clad mountains after sunset (analogous to the glowing of the Alpine snows) was seen several times on those nights when there was no moon. We saw it particularly well near Chibra to the north of Karakorum. Judging of it as we saw it there, we think it to be quite independent of a spontaneous development of light from snow. It was evidently caused by an illumination of the snow-fields from the west north-western parts of the sky. This illumination is only visible sometime after the sun has set, namely, when the projection of the earth's shade has reached an angular height exceeding that of the mountains, and when the atmospheric light has decreased so much that the atmosphere behind the mountains reflects less light than the snow-clad slopes of the mountains exposed to the west north-west.

At heights above 17,000 feet we found in the Kuenluen, the transparency of the atmosphere so great, that the small and the large circles in Saussure's diaphanometer (as we had used it also formerly in the Alps of Europe, and described in our "Researches") disappeared under the same angles, and therefore the transparency above 17,000 feet was so great that a stratum of air, 3,000 to 3,500 feet thick, absorbed the light in so small a degree, that the absorption to our eyes became unappreciable. It was then determined by another method, by which a stratum of much greater thickness could be examined.

The transparency of the atmosphere is often very much affected by a peculiar haze not affecting the psychrometer; we found this

dry haze particularly frequent when we were on the plateau to the north of Karakorum.

The height of the clouds is generally very great. Even during the rain, which fell from the 25th to the 28th July, it exceeded 17,000 feet. Fogs in the valley of the Indus at 11,800 feet were observed only once on the 23rd September, on which day the rain began at 1-10 A. M. Its temperature was, when it first fell, 4.6° C. = 8°.3 Fahr. below the temperature of the air, (air, 7.9° rain 3.3° C.); it only reached the temperature of the air at 9 A. M., when the psychrometer had also become equal to the temperature of the air.

The daily variations of the barometer, also at heights of 17,500 feet bar. 385 millimeters, had still the same form as at lesser elevations, showing particularly a decided minimum near 4 P. M. The difference between the daily extremes reached then only 2.5° millimeters. Also at lower elevations, such as 11,000 to 12,000 feet, we found the variation of the barometer very small: at Leh, the difference between the two greatest extremes observed in *three months*, was only five millimeters.

Vegetation, Animals.

The number of species of plants, as well as the number of individuals, is exceedingly limited on the higher parts of the Kuenluen. Lichens are completely wanting in the dry angular gravel covering the high plateau and slopes of the mountains in their neighbourhood; they are only to be found among the moraines, which are generally moister. More surprising still is the abundance of vegetation, particularly of grass on the most northern slopes descending to the valley of the Yarkand and its northern tributaries. But even there, the number of species is smaller than at first sight we were led to expect. The increase of vegetation seems to coincide with the increase of rain mentioned above.

Birds, even birds of prey, are exceedingly scarce in the central parts. Quadrupeds are much more numerous. We found wild yâks, the existence of which in the wild state has been doubted, Kiangs, five or six species of wild sheep and goats, hares and mice, as high as 16,000 to 17,000 feet. Their number as well as the variety of species is remarkably great when compared with the great scarcity of vegetation.

Report on the Progress of the Magnetic Survey of India, and the Researches connected with it, from May to November, 1856.—*By* M. Adolphe Schlagintweit.

Route.

I left Simla on the 28th of May, proceeding through Kulu and Lahoul to Zanskar in Thibet (arrived 26th June). I was chiefly occupied with the examination of the western parts of Thibet, and of a considerable part of the Kuenluen range to the northward of Thibet.

I arrived at Khabbulu on the 21st July, and penetrated by a transverse valley from Khabbulu and Shigar up to the water-shed of the Kuenluen range. The most northern point reached was the Mustak Pass (20th August, 18,800 Eng. feet). The predatory habits of the wild Mahomedan tribes of Hunze, which infest the country on the other side of the Mustak, prevented my proceeding further on in this direction in the Kuenluen range. I had the opportunity of reaching, on the 29th of July, on the Chorkonda peak, an elevation of nearly 19,500 Eng. feet (calculated approximately from Ladakh) and made a series of physical experiments during the ascent.

I arrived at Iscardo on the 1st of September, after an examination of the elevated mountain groups near the point where the great southern bend of the Indus takes place. I arrived at Kashmeer on the 9th of October, and left on the 2nd of November for Murree and Rawul Pindee, (arrived 17th November). According to the plan of our operations sanctioned by Government, during the present cold season a part of the Punjab and of Scinde will be examined.

To obtain geological and meteorological observations for a part of the Himalaya, which we could not visit ourselves, my draftsman, Eleazar Daniel, and Mr. Monteiro, attached to my brother Hermann's establishment, with some geological and plant collectors, were sent through the outer ranges of the Himalaya from Simla, viâ Kangra and Noorpoor to Kashmeer.

Their barometric and meteorological observations carried on regularly at Kangra, Noorpoor, Jummoo and Kashmeer, will be of much value for the calculation of our own barometric observations.

Magnetic Observations.

Magnetic Observations were made by me at the following stations:—

Simla.
Sultanpore.
Kardong in Lahoul.
Zanskar.
Dah.
Huche,
Camp on the upper part of Chorkonda glacier 15,800,
Chutron,
Camp at the foot of the Mustak Pass,
Iscardo,

These stations are situated on the northern side of the Indus in the Kuenluen range.

Astor,
Guryhs,
Kashmeer, where a continuous and regular series of hourly observations were taken.
Murree,
Rawul Pindee continued hourly observations.

I also subjoin a list of the magnetic Stations made during the same period by my brothers, Hermann Schlagintweit and Robert Schlagintweit:—

Simla,
Rampoor in Bissahir,
Mood in Spiti,
Korzok on the Tso Moriri Lake,
Pangkong Lake,
Ladakh, (Leh) regular series of hourly observations for two months (See Report of Hermann Schlagintweit and Robert Schlagintweit, p. 116.)
Sassar Pass,
Karakorum Pass,
Sumgal, in Turkistan,
Suget, in ditto,
Kargyl,
Dras,

Kashmeer,
Murree,
Mozufferabad,
Rawul Pindee.

The following gives the magnetic dip ascertained at some of the more important stations,

Camp at the foot of the Mustak,	50°	2′
Chorkonda glacier,	48	40
Astor,	48	23
Iscardo,	48	20⅓
Guryhs,	47	37½
Kashmeer,	46	55
Murree,	46	11
Padum,	45	24
Sultanpoor,	43	54½

Some of the principal Stations made by Mr. Hermann Schlagintweit and Mr. Robert Schlagintweit, are subjoined for comparison:—

Suget in Turkistan,	50°	4′
Sumgal in do.,	50	1
Karakorum Pass,	49	8
Sassar Pass,	48	11
Ladakh, (Leh,)	46	54
Kargyl,	48	10
Dras,	46	58
Mozufferabad,	47	2

These observations, as well as the observations given in our former reports, show that the increase of the dip or inclination of the magnetic needle compared to the latitude, is very rapid in India and in the mountain system of High Asia.

The declination of the magnetic needle is constantly to the eastward in the whole of the western Himalayas, Thibet and the Kuenluen mountains.

The easterly declination is every where pretty considerable, being for instance—

2° 44′ to the east in Leh.
2 12 ..... Suget.

and still very nearly 2° to the east in Astor, which place was the most westerly of our stations.

It seems to be quite evident that the lines of the magnetic declination undergo a sensible irregularity in the mountain systems of High Asia (comprising the Himalaya, Thibet and the Kuenluen) that is to say, the declination in these mountains in the same longitude is more to the eastward, than it is in the same longitude in the Indian Peninsula.

Meteorology.

The barometrical and meteorological observations have been daily carried on regularly as before. I may be permitted to mention a few of the results.

1. The barometric observations made at several elevated and isolated stations (between 16,000 and 18,000 Eng. feet) hourly for one or several days, have shown that the diurnal barometric variation at great heights in the Himalayas, is similar to that in the plains ; the minimum pressure takes place between 3 and 5 P. M.

The difference between the maximum and minimum, however, is constantly very small and considerably less than it is in places of less elevation above the sea.

2. The diurnal variation of the barometer in the mountain systems of High Asia is therefore different from the barometric variation at elevated peaks of the Alps of Europe where the maximum pressure takes place in the early hours of the afternoon.

The summer heat in the valleys of Balti, elevated only from 7,000 to 8,000 Eng. feet, is very considerable. I observed from the 1st to the 20th July, in the valleys of the Indus and Shyok, very generally, the following maxima and minima of temperature; maximum of the day 32° centigrade, minimum of the night 15° to 16° centigrade ; average of the day 23° to 24° centigrade.

The decrease of temperature from these heated rocky valleys to the higher peaks is very considerable.

3. The direction of the winds in western Thibet is very much affected by the great local heat produced in the deep rocky valleys; regular morning and evening winds, sometimes very violent, prevail during the summer months in the valleys of the Indus and

Shyok and in the valleys of their larger tributaries, but at greater heights southerly winds prevail as a general rule up to the watershed of the Kuenluen.

These southerly winds are compensated by northerly winds which have been observed in Turkistan by my brothers, at the same time that I constantly experienced southerly winds on the east of the Kuenluen mountains.

4. The quantity of rain and snow that falls in the western parts of the Kuenluen, in the environs of the Mustak Pass, &c., is considerably more than in the eastern parts of the chain about Karakorum; in consequence the snow line near Mustak (17,900 ft.) is much lower than on the Karakorum mountains (18,600 ft.) determined by my brothers; in consequence also, a great number of large glaciers occur in the western Kuenluen, whilst in the very rainless Karakorum group glaciers of a similar size do not exist.

The greater amount of rain and snow which falls in the western Kuenluen seems especially to be due to the wide opening which exists along the southern parts of the valley of the Indus.

Through this opening the moist winds from the plains of India can penetrate more freely to the high ranges of Mustak than to the Karakorum mountains, where they have to cross the high Himalayan ranges.

The total amount of rain and snow on the western Kuenluen ranges, may be estimated to be about 10 inches a-year; by far the greater part of which is snow-fall in winter. There is very little rain in summer. The total amount of rain and snow in the valleys of the Indus and Shyok is less than in the Kuenluen.

5. Owing especially to the absence of summer rains, and to the dryness of the heated atmosphere produced by the insolated rocky slopes of the valleys, no natural forest of any kind exists in the valleys of western Thibet, though they are only elevated 7,000 to 8,000 Eng. feet above the sea.

At an elevation of 12,000 to 15,000 Eng. feet a rich shrub vegetation of a large species of juniper, of willows and birches is generally met with; below 12,000 feet this shrub vegetation becomes much thinner and disappears almost entirely, owing to the greater heat and dryness.

6. The heat and dryness of summer in Balti, which is so much opposed to the growth of Coniferæ and other forest trees, exercises a very different influence upon the growth of artificially planted fruit trees which are very abundant.

The fruit trees reach in Balti to a much greater elevation than in the Himalaya; the upper limits (of the walnut for instance) in Balti and the Kuenluen is 11,000 feet, whilst in the Himalaya, it is only 9,000: the apricots (a characteristic tree for the Balti valleys,) which are nearly unknown in the Himalaya, reach 10,000 to 10,500 ft. Apples and grapes show a difference still greater than in the case of the walnuts. The cause of it is, that in the Himalaya the summer rains tend to lower the summer temperature in the higher valleys owing especially to the cloudy state of the atmosphere.

In the upper Himalayan valleys, the summer rains just set in at a time when these fruit trees are still in flower or beginning to form the fruit.

7. The observations of the *temperature of the ground* at various depths mentioned in our former Reports were carried on at many stations, both by my brothers, and by myself.

The following are the temperatures of the ground observed at one meter, (3 feet 3 inches) below the surface at some of the principal places.

The thermometers were buried in a level open ground which was freely exposed to the rays of the sun.

Stations, &c.	*Temperature at* 1 *meter* (3 *feet* 3 *inches*) *below the surface.*
Sultanpore, 5th to 7th June,	24.5°
Kohsar, 8th to 9th June, (12,000)	9.4
Kardong, 10th to 14th June, (12,000)	9.6
Padum, 24th to 27th June, (12,000)	9.7
Dah, 5th and 6th July, (9,700)	18.3
Chorkonda, 21st and 22nd July, (12,000)	14.2
Shigar, 4th and 5th August, (8,200)	18.7
Chutron, 8th, 9th and 10th August,	20.0
Isoha, Camp near Mustak glaciers, 19th and 20th August, (17,000)	8.0

Camp near Mustak glacier, 24th, 25th aud 26th August, (16,000).. 10-1
Astor Fort, 10th and 11th Septr., (7,600) 16-0
Pattere Brock, 13th and 14th, (10,800) 12-3
Ladakh, 11,700 Eng. feet ascertaiued by my brothers.
„ Average for July,..... 17-6
„ „ August, ... 20-0
„ „ September, ... 19-5
Kashmeer average, for October, for 1 meter,.. 18-5

The numbers in the above table show the very considerable temperature of the ground at 1 meter below the surface in the valleys of the Kuenluen during summer. It is considerably higher than the temperature at equal heights and equal depths below the surface in the Himalaya mouutains.

This fact is especially due to the rains in the Himalayas which tend to cool the grouud.

In the Kuenluen on the contrary the ground is very dry, and considerably heated by a nearly uninterrupted insolation.

8. The following are the results obtained for the temperature of the grouud at great depths below the surface, where the temperature may be assumed to be very nearly stationary. Small wells were dug for the purpose, and the iuseusible thermometers inserted iu the bottom; the hole was filled up entirely and only re-opened after a considerable time.

Ladakh. Ascertained by my brothers 43½ feet below the surface, July, ... 13.4° Cent.
Iscardo,—temperature of several springs at the foot of small hills and at the foot of high banks of alluvial clay, ... 14.4 to 14.6
Kashmeer, 36 Eng. feet, October, ... 17.0

The following were the temperatures observed in the same locality at Kashmeer at different depths below the surface.

At 32 Eng. feet below the surface, ... 17°.2
At 21½ do. do. 17.4
At 6½ feet average for October,..... 18.5
Rawul Pindee, at 47 feet, 9 inches, November, 20.05

Geology.

9. The Kuenluen on the one side and the Himalaya on the other, form evidently only parts of one great system of elevation; Thibet is situated between them; it is an undulating country, with many high mountain ranges which are generally considerably lower than the chains containing the culminating peaks of either the Himalaya or the Kuenluen. Only in some parts, for instance in the lacustrine basin of the Sutlej, Thibet assumes the form of an elevated plain properly so called.

10. The geological structure of the two above mentioned mountain chains is closely allied, even the exterior features of the mountains, in some parts of the Kuenluen about Mustak, are much more similar to those of the Himalayas than might be expected.

11. To the westward, the Himalaya and Kuenluen are separated only by a very narrow belt of mountainous country, 30 to 50 miles broad; it is composed of hornblendic rocks and of a very narrow stripe of fossiliferous paleozoic rocks which are clearly interposed between the elevated felspathic masses, which border them to the north and to the south.

The western termination of the Himalaya may be considered to be at the great southern bend of the Indus.

On the western side of the Indus the Himalaya and Kuenluen cannot be traced as separate chains; they form one mountain mass, the elevation of which decreases very rapidly to the westward.

I had the opportunity of examining a very considerable part of these mountainous ranges from some elevated points in *Astor*, and obtained much information about the topography of the countries of Gilgit, Jassin, Chitroul and Mustak.

Already in Jassin and Chitroul the mountains have lost, to a great extent, their Alpine character; there no longer exist any large glaciers, and the Passes are all lower and many are even passable during winter.

Both in the Himalaya and Kuenluen, the central groups are composed of felspathic crystalline rocks. Many of them show very distinctly the fan-like arrangement of cleavage, which was first observed in the Alps.

In the western Kuenluen, the fan-like structure is exceedingly well developed, the Mustak Pass lies in just about the position, where the cleavage lines run vertically; to the westward of Mustak, the dip is easterly; to the eastward the dip of the cleavage is quite in the *opposite* direction.

13. In the Kuenluen, no *fossiliferous strata* have been met with; the crystalline limestone and gypsum strata which occur in many places form part of the metamorphic micaceous shists, between which they are interposed.

Associated with the gypsum are found in many places hot mineral springs, mostly sulphureous. The hot springs and the gypsum can be traced all along the southern part of the Kuenluen from the origin of the Indus near the Mansarauer Lake to the western Kuenluen around Mustak. We had the opportunity of examining in this range hot springs in more than ten different localities. Some of the springs have a temperature of 90° to 92° centigrade at elevations of 11,000 to 12,000 Eng. feet above the sea; they must be reckoned amongst the hottest springs in the world.

14. The fossiliferous strata which have been described last year in Gnari Khorsum near the origin of the Sutlej, form a pretty continuous band at the northern foot of the Himalaya all along through Western Thibet.

In many places, for instance in Spiti, Zanskar and near Iscardo, fossil remains have been found perfectly identical with the species, collected last year in the more eastern parts of Thibet.

The strata contain fossils from the silurian up to the oolitic group, but no cretaceous fossils, and no nummulites occur on the northern side of the Himalayan water-shed. The fossiliferous strata have been altered in many localities by intrusive greenstones, which sometimes occur in very considerable masses.

15. On the southern side of the main range of the Himalaya, fossiliferous sedimentary strata of great extent are met with.

Already last year, I had the opportunity of pointing out the fact, that the true crystalline felspathic rocks, granite and gneiss, occupy a comparatively small surface in these mountain systems. These rocks form a number of groups of very different size, and in some places, for instance to the northward of Kashmeer, the extent of the

central crystalline rocks is very limited indeed. Large tracts of country in the Himalayas, south of the water-shed, are occupied by sedimentary marine strata, which contain in several places fossil remains. The slate and limestone mountains about Kashmeer yielded a large number of oolitic fossils many identical with those found in Thibet, the same were met with in Kulu and in the mountains near Simla. To the eastward, where as yet no fossils have been discovered, the alteration of the sedimentary strata by intrusive felspathic rocks seems to have been more considerable than at the western end of the chain. To the south of Kashmeer a zone of nummulitic marls and of sandstones of 39 to 50 miles broad borders the Himalaya towards the plains of India.

16. From the observations now collected, it seems that the ocean in the oolitic period extended from the southward across the country where the Himalayas are now situated as far as Thibet. The ocean of the nummulitic period on the contrary no longer extended so far to the northward. It covered a large part of western Asia, of Scinde and the Punjaub, and had its border formed by an elevated range of the then already existing Himalaya.

17. The excavation by the valleys of the eroding power of streams has been carried on to a very great extent—the considerable fall, which rivers like the Indus and Sutlej experience on their course from Thibet down to the low plains of India, has increased their excavating power in a surprising manner.

In the valley of the Indus near Iscardo, in the valley of Astor near the place where the Indus enters the Himalaya, I on several occasions observed gravel, and sand beds evidently deposited by these rivers, and ancient marks produced by the large streams on the rocks at elevations of 3,000 and 4,000 Eng. feet above the present level of the rivers. We have many proofs independent of each other to show the great depth to which all the valleys of the rivers tributary to the Sutlej and Indus have been excavated.

18. In the western Kuenluen very large glaciers from 10 to 15 miles long exist in several valleys. We mentioned last year that in the Himalayas nearly all glaciers show evident marks of being somewhat smaller at present than they were at some former

period; the same fact has been very generally ascertained in the western Himalayas as well as in the Kuenluen.

The decrease of glaciers is comparatively small, but general; no traces of a very large ancient extension of glaciers, like the one supposed by some geologists to have taken place in a general "glacial period" in the Alps, could be found in the mountains of High Asia.

The decrease of glaciers as observed by us must be due to some general change in the climate of the surrounding country, and I think that we have numerous observations to show that this change of climate is due in a great measure to the great excavation of the Thibetan and Himalayan valleys by the action of the rivers.

Many of the valleys of Western Thibet exhibit ancient water marks at 3,000 and 4,000 feet above the present bed of the river. The sides of these rocky valleys, thus gradually excavated, are now heated under the influence of the sun to a much greater extent than was the case formerly; the warm air thus produced, ascends the valleys and tends to melt the ice of the glaciers, near the origin of the valleys, to a greater extent than was the case before the excavation of the valleys had taken place.

Entomological Papers, by* JOHN NIETNER, *Colombo, Ceylon.*

43 *Cyclosomus dyticoides. N.*

C. suborbicularis, depressus, obscure castaneus, elytris piceis fasciis 2 testaceis ornatis, pedibus brunneo—testaceis, tarsis, anteunis oreque magis minusve brunneis. Long. Corp. 4½—5 lin; lat. 2½—3 lin.

Antennæ art. 3-11 *depressis.* Thorax transversus antice profunde semilunariter sinuatus; basi quadratus, medio leviter subquadrate emarginatus, elytris parum angustior, ante scutellum subtiliter strigosus; apicem versus sensim angustatus. Elytra basi subquadrata, striata, fasciis 2 (una subhumerali, altera subapicali) transversalibus, interruptis, interstitia 2-8 occupantibus, testaceis ornata.

* Continued from No. VI.—1856, p. 554.

Pedes tibiis apice 2-calcaratis, *calcaribus 2-serratis, tarsis maris 2 anterioribus art.* 1-3 *subtus leviter dupliciterque penicillatis, inter mediis fortiter simpliciterque penicillatis.* Prosternum subhastatum.

In prov. occid. arcnis peraridis Amararum more victitat.

To judge from what Lacordaire says of this g. in his gen. des col. (a work which, as I have said elsewhere, I look upon as containing the essence of all former researches) it would appear that the present species differs very materially from the three others hitherto described, namely in the flatness of the antennal joints, in the serrated edges of the tibial spurs, in the existence of the tarsal brushes in the male and in the colour—to say nothing of some other minor distinctions. The three first of these peculiarities (too important not to have been noticed by Lacordaire or any other describer of the g. had they been aware of them) add considerably to the characteristics which already constitute this g. one of the most remarkable of the extensive family of the Carabidæ, whilst through the colour of the present species it becomes still more closely and more strikingly allied to certain Dyticidæ (Hydaticus) than has hitherto been the case.

The prevailing colour of the insect is deep chestnut, lighter along the sides of the thorax, the elytra darker. The latter are variegated with 2 transverse belts of irregular outline and interrupted in the middle near the suture; one of these is subhumeral, the other subapical; they are of yellowish colour and reach from the first to the eighth stria, a small discoloured spot being projected from the subhumeral belt on either side to the ninth stria and a discoloured prolongation of the other filling the apical angles, with the exception of a dark spot; the margin is also of a more or less brownish colour. The legs are dark yellowish with chestnut tarsi; the mouth and antennæ are brown, the latter light at the base. These colours vary altogether from lighter to darker. The head is of the typical sculpture, it has 2 impressions at the posterior margin of the clypeus and is finely sulcated between the eyes. The antennæ are strong, stiff and short reaching hardly beyond the base of the thorax, joint 1 is of middling size, 2 short, 3, 4 are subequal 5 rather shorter, 6-11 still shorter, subequal, joints 3-11 *are strongly compressed and pubescent, but only on the narrow side.* The labrum is deeply subtriangularly emarginated in front and increases in breadth towards its base. The

maxillæ are furnished with a thick brush at the apex much of the rough appearance of a minute bundle of coir. The inner edge of the lobes of the mentum is very broadly cut away. The ligula appears, what I understand it to be from Lacordaire's description, coriaceous, of middliug size, of the shape of an oblong square, depressed in front and at the sides, set in its membranous and ample paraglossæ as in a broad frame; the whole obliquely truncated at the anterior angles, and ciliated along the anterior margin. The palpi can hardly be said to be truncated at the apex of the 4th joint, finishing off rather like an acorn. The remaining parts of the mouth and the head in general are of typical construction. The thorax is strongly trausverse, subquadratic at the base and firmly applied to the elytra but not quite as large. The latter being also subquadratic at the base, the place of the juncture of these two parts of the body presents, upou close inspection, rather a peculiar appearance. The thorax is geutly narrowed towards the apex, the anterior part is deeply emarginated in the shape of a crescent, the posterior part slightly so at the middle, the emargination being long, shallow and nearly rectangular, its external corners fitting into two deep notches in the base of the elytra. The anterior angles are rather acuminated. The back is elevated and divided by a longitudinal line, it has 2 impressions at the base and is finely sulcated just in front of the scutellum. The elytra are furrowed and irregularly impressed with deep punctures along the 9th ridge, they are slightly dehiscent at the apex. *The legs of the male* are of the following description: strong coxæ, trochanters and femora simple, the latter slightly setose, the anterior tibiæ strongly dilated towards the apex and costated, strongly spinoso-dentate at the outer edge, with a strong, blunt spur at the notch and another at the apex, the latter place, moreover, furnished with spines. The intermediate and posterior tibiæ with 3 rows of spines along the outer and 2 rows of stroug bristles at the inner side—all inserted ou ridges, strongly 2-calcarated at the apex, the inner spur longer than the outer one. *These apical spurs of the tibiæ are in all the legs slightly compressed and serrated on the* 2 *narrow sides.* The anterior tarsi have joints 1-4 slightly dilated, *the apex of the first and the* 2*nd and* 3*rd being at the same time furnished each with* 2 *small white brushes below fenced in by spines.* Joint 1 is

triangular with the external apical angle strongly prolonged, 2 and 3 are almost equal, transversely ovato—subcordiform, 2 slightly but distinctly prolonged at the external apical angle, 3 less so, but still prolonged, 4 small, cordiform, 5 long subcylindric, joints 1-4 with 2 spines at the apical angles, these spines removed in the 5th the one to a subapical and the other to a position at the middle; in joints 1-3 these spines are shorter and thicker at the outer angle than at the inner, in the 4th this difference is scarcely observable and in the last it does not exist; the claws are strong and simple. The intermediate tarsi are elongated, joint 1 triangular, 2 and 3 nearly equal, quadrato—subcordiform, 4 of a similar form but much smaller —all furnished with spines at the apical angles in the manner of the anterior tarsi. *The inner side of the apical half of joint* 1 *and joints* 2 *and* 3 *with strong brushes of reddish colour bordered by rows of spines, the entire lower surface forming one thick brush and not two as in the first pair.* The posterior tarsi are still more elongated, joints 1-4 decreasing gradually in size, subcylindric, 5 quite so, all armed like the preceding. *The legs of the female* are very similar to those of the male, still there is some difference in the tarsi: the brushes are wanting, the anterior pair has joints 1-3 fully as much and 4 more dilated, joints 2-4 are subcordiform, 2-3 rather more prolonged on the outer side than in the male. In the intermediate pair the joints are more distinctly triangular. The prosternum is elliptic, pointed at the apex, or of the shape of a spearhead with the lateral angles rounded off, it is depressed at the sides, strongly marginated (as is also the anterior part of the mesothorax) being furnished with a few thin hairs within the margin. The size of the individuals is no criterion as to their sex, sometimes the female sometimes the male being the largest.

Regarding the habits of these insects one would feel inclined to suspect them to be of a semiaquatic nature, that is the insects to frequent the banks of rivers or other damp places—however, the direct contrary is the case: *they live in the driest, hottest and sandiest places that can be found, where they burrow in the sand exactly in the manner of the well known g. of the Amaras.* In the course of 6 years I have taken but 2 of these interesting insects, both in the neighbourhood of Negombo, the one in the Cinnamon

gardens there, the other flying on my table at night. Of late, however, I have been more fortunate taking considerable numbers of them in the Cinuamou gardens of Colombo in holes, made by the rooting up of weeds, into which they had run and could not escape, the loose sand giving way under them whenever they attempted to do so. When wishiug to find them I had to search the corners of these holes, where some leaves had usually collected, when I have sometimes dug up eight at a time, frequently rather deep in the sand. They are quick of motion and being thus pursued immediately bury themselves in the sand.

On reconsidering the peculiarities which so effectually distinguish this species from the 3 others known, aud which I have thought it not superfluous to set forth at such length, I am doubtful whether there is not ample reason for forming it iuto a new g. unless indeed the other species were very imperfectly known and described, which latter I almost suspect with regard to the foot-brushes of the male. If, however, otherwise the diagnosis as given by Lacordaire requires at all events to be entirely recast and the g. to be removed from the tribe Cratoceridæ, (oue of the characteristics of which is the waut of foot-brushes iu the male) in which he has placed it; and, this being agreed to, I would, taking all its peculiarities into consideration, propose to carry out Lacordaire's idea and to form it into a new tribe "Cyclosomidæ" to which it appears as much eutitled as the g. Omophron.

Trib. Bembidiidæ.

Ochthephilus. n. g. N.

Corpus oblongum, subparallelum, valde depressum. Caput magnum antice trigonum; oculis magnis, ovatis, prominulis; collo forti. Mentum subquadrate emarginatum, lobis extus fortiter rotundatis, apice abrupte acumiuatis, dente parvo acumiuato. Ligula parva apice quadrate truncata, libera, paraglossis setiformibus marginem anteriorem longe superantibus. Palpi robusti art. 4° elongato, tenui, acuminato; maxillares art. 3° interne—, 2° externe incrassato; labiales art. 3° robusto externe incrassato, 2° parvo, cylindrico. Labrum parvum subtrigonum, antice emarginatum. Mandibulæ, elongatæ, rectæ, trigonæ, apice arcuatæ,

infra medium plurics dentatæ. Antennæ robustæ corporis med. fere attingentes, art. 1° et 11° mediocribus, subæqualibus, 2-4 et 5-10 inter se subæqualibus, illis subcylindricis, his ovatis. Thorax subcordatus basi quadratus. Pedunculus brevis. Elytra, apice rotundata. Pedes omnes simplices, subæquales, anteriores tibiis profunde excavatis, tarsis leviter contractis, art. 1-4 gradatim minoribus, art. 1° subcylindrico, 2-4 subtrigonis, 5° sat magno, unguibus simplicibus.

44. *Ochthephilus Ceylanicus. N.*

O. brunneo-testaceus, pedibus palpisque testaceis, tenuiter pubescens; fronte profunde 2-sulcata; elytris obsolete striatis, in striis punctatis; long corp. $1\frac{1}{3}$ lin.

In fluminum ripis Bembidiorum more victitat.

This interesting little beetle might at first sight be mistaken for a Læmophlœus, of which it has the size, depressed form and colour, the prominent eyes, however, and cordate thorax—to say nothing of its habitat—remind one very soon of its real connexions. I do not think there can be any doubt that this insect forms a new and interesting addition to the Bembidiidæ. In fact the question whether it belongs to this tribe or not, depends, in my opinion, mainly upon the inferences drawn from the structure of the terminal joint of the palpi. It is true that this joint attains in Ochthephilus a degree of development unequalled amongst the Bembidiidæ; as, however, this development is not confined to the one particular joint alluded to, but affects the entire organ of which it forms a part, it can hardly be said to be a variation of much importance; and as, moreover, the general shape (independently of the elongation) and mode of insertion are the same as in the typical Bembidiidæ I have not hesitated to refer my n. g. to this tribe.

The head is as broad as the thorax and altogether of about the same size, it is strongly triangular from the eyes to the tip of the mandibles, the forehead is impressed with 2 deep longitudinal furrows, the eyes are large, rather oval and prominent, behind them the head is abruptly contracted into a thick neck. The antennæ are long and thick reaching nearly to the middle of the

body, joints 1 and 11, 2 4 5-10 are subequal amongst themselves, 5-11 oval, 1-4 subcylindric. The labrum is small, rather triangular being narrowed at its base, it is emarginated in front with a slight angle in the middle of the emargination. The mandibles are long, straight, triangular, bent at the tip only, dentated below the middle, the one more so than the other. The maxillæ are thin and slender, gently bent outwards at the base and inwards at the apex, the outer lobe corresponding with the inner one in shape and strength. The palpi are robust, both the maxillary and labial ones have joint 4 elongated, thin and acuminated, in fact needle-shaped, firmly implanted in the preceding one, not loosely hinged to it. The maxillary ones have joints 3 and 2 robust, the former swollen on the inner, the latter on the outer side. In the labial ones joint 3 is still plumper than in the others, but differs in shape by being incrassated on the outer instead of the inner side, the 2nd joint being at the same time quite small and cylindric. The mentum is large and simple as above described. The ligula is small, oblong, very slightly narrowed and transversely cut away at the apex; the paraglossæ separate from its sides a little below the anterior corners; they are setiform and reach much beyond it. The whole organ is of membranaceous texture having, however, a more substantial centre or back. The thorax and elytra are simple and sufficiently described above. I may add that the former is divided by a longitudinal furrow and that both are furnished with a narrow margin at the sides. The scutellum is very small and the abdomen furnished with a short peduncle. The legs are weak, simple and nearly equal, the anterior tibiæ are deeply notched, the lower margin of the fourth tarsal joint of the same pair is furnished with a long thin spine the apex of which fits in betweeu the claws. I have been unable to discover any footbrushes or other sexual distinctions in the specimens before me, but it is not improbable that the tarsal spine just mentioned occurs only in one sex.

The habits of the insect are those of the Bembidia, in whose society it lives upon the banks of rivers, like them taking readily to its wings. I have found it occasionally in considerable numbers upon the sandy banks of the Maha Oya in the neighbourhood of Negombo, close to the edge of the water.

Trib. Lebiidæ vel Pericalidæ.

Creagris. n. g. N.

Corpus oblongum valde depressum. Caput magnum robustum; oculis mediocribus, ovatis, sat prominulis; collo brevi. Mentum forma ferri equini vel trifurcatum (hinc n. g. Creagris) lobis angustis, subparallelis, inter med. et apic. leviter dilatatis, apice oblique truncatis, dente lobis parum breviore, tenui, acutissimo. Ligula magna cornea, infra apicem leviter constricta, angulis anticis rotundatis paraglossis connatis, apicem non attingentibus. Palpi maxill. art. 4° claviformi, apice fortiter truncato; labiales art. 4° subelliptico, truncato. Labrum maximum, suborbiculatum, convexum. Mandibulæ parvæ, basi obsolete unidentatæ, labro obtectæ. Antennæ robustæ humeros attingentes, art. 1, 3 et 11 longitudine fere subæquali, mediocribus, 2° parvo, rotundato, 4-10 subæqualibus, cum 11° ovatis. Thorax parvus capite sesqui minor, transversus longitudine duplo fere latior, infra med. fortius angustatus, basi parum prolongatus. Pedunculus brevis. Elytra apicem versus leviter dilatata, apice fortiter subquadrate truncata. Pedes robusti simplices, subæquales, ant. tibiis profunde excavatis, omnes tarsis brevibus art. 1° sequentium 2 fere longitudine, subcylindrico, 2 3 gradatim minoribus, magis minusve triangularibus, 4° magno, profunde bilobo, 5° mediocri, unguibus simplicibus, art. 4° subtus dense penicillato.

45. *Creagris labrosa. N.*

C. picea, ore antennisque, coxis, trochanteribus femorum tibiarumque apice et tarsis brunneis; dense punctata obsoleteque pubescens; elytris striatis; long. corp. $4\frac{1}{2}$ lin.

Specimen singulum prope Colombo nocte ad lumen cepi.

I consider this scarce and interesting insect to form a passage between the Lebiidæ and Pericalidæ, but am doubtful to which of these two tribes to refer it, as, although it partakes of the characteristics of either, it is at the same time distinct from either. Distinguished in several respects, its most extraordinary character lies in the curious shape of the mentum. This is, however, easily described as large, of the shape of a *horseshoe* with a long, thin, very pointed tooth in the middle, the apical half of the sides (lobes)

being at the same time gently dilated, the apex itself being obliquely cut away from the outer towards the inner side (the inner angle being the most advanced) and slightly dentated at the edge thus formed. Or it may also be described as *a fork* with the outer teeth somewhat enlarged, truncated at the apex and so forth. As far as I know, this variation from the usual form of the mentum is repeated in no other Carabideous insect. The other parts of the mouth have not much to distinguish them with the exception, however, of the labrum, which attains a very extraordinary degree of development, occupying *rather more than one third of the whole head, although the latter itself is large and heavy.* It is of a suborbicular shape, very slightly produced in front into an obtuse angle, it is vaulted, covers the mandibles, has two longitudinal impressions at the sides of the base and is highly polished. The head has 2 impressions in front of the eyes, is densely punctured and thinly pubescent, it is strongly but gradually contracted behind the eyes and formed into a short neck. The antennæ are strong and reach to the shoulders, joints 1 3 and 11 are of about equal length, middling, the former two subcylindric, joint 2 is small, rounded, 4-10 subequal and with the 11th oval. The thorax is small only half as large as the head, rather narrowed, strongly transverse, twice as broad as long, slightly emarginated in front, the anterior angles rounded, contracted below the middle, subquadratic and prolonged at the base, posterior angles depressed, longitudinally divided by a deep furrow. The elytra are striated and, like the thorax, densely punctured and thinly pubescent. The legs are strong, simple and subequal, the anterior tibiæ are deeply notched, the first joint of the tarsi is as long as the two succeeding ones together, subcylindric, the 2nd triangular, the 3rd of a similar but more transverse form, smaller—all three have the apical angles accuminated, the 4th is large and deeply bilobed, the 5th middling, thin, the claws simple. The tarsi are altogether short and strong, the first joint is furnished with longer, the 2nd and 3rd with shorter stiff hair, whilst the 4th is strongly penicillated below. The anterior tibiæ are slightly spinose, the others more so.

I believe the only specimen of this insect which has hitherto come into my possession, and which has served as a type for the above description, to be a female.

Trib. Galeritidæ.

Heteroglossa. n. g. N.

Corpus oblongum, subparallelum, depressum tenuiter hirsutum. Caput medioere oculis semiglobosis, sat prominulis; collo brevi. Mentum sat profunde subquadrate emarginatum, lobis magnis extus fortiter rotundatis, apice abrupte acuminatis, dente magno excavato, apiee inflecto obtuso, magis minusve profunde sinuato. Ligula subcornea apiee libera, truncata, vel quadrata vel obconica vel leviter bisinuata; paraglossis cyliudricis, marginem anteriorem longissime superantibus, magis minusve arcuatis. Palpi hirsuti art. ultimo sat elongato, subcyliudrico, apice truncato vel subtrigono. Labrum transversum antice emarginatum. Mandibulæ validæ, trigonæ, apice arcuatæ basi pluries dentatæ. Antennæ robustæ corporis med. attingentes, art. 1° incrassato sequentibus 2 longiore, 2° parvo, 3-11 subæqualibus. Thorax subcordatus, basi transversim truncatus leviterque prolongatus. Peduneulis brevis. Elytra apice fortiter subquadrate truncata, costata, costis 16 majoribus, in interstitiis subtilissime bicostulata, in suleis (suleo e tribus inter costas binas majores medio exeepto) tenuiter pilosa, in omnibus trausversim rugulosa. Pedes anteriores tibiis sat fortiter emarginatis, tarsis maris art. 1-3 leviter dilatatis, subtus squamularum seriebus 2 munitis, art. 1° elongato-trigono, 2-3 rotuudato-trigonis, 3° præcedeute parum minore, 4° parvo cordato 3° plus sesqui minore, his omnibus angulis acumiuatis, 5° magno, unguibus simplicibus.

This diagnosis may appear somewhat vague, still I have been unable to express the characteristies of the insects from which it is drawn in more precise terms, although they have features quite peculiar to themselves by which they are easily reeognised when once seen.

The points on which the 3 spec. which form this g. more or less disagree are the following: (1) the labrum: this is more transverse in *H. elegans* and less deeply emargiuated in *H. ruficollis* than in the other 2 spec. respectively—still in all 3 it is *emarginated* and has, moreover, the peculiarity of being furnished with bristles at the 2 anterior corners. (2) the mentum: this is subquadratically emarginated, the lobes being strongly rounded on the outer side, and abruptly acuminated at the apex, at the base of the emargination

it is furnished with a broad, excavated tooth which is inflected and obtuse at the apex—so far all three species agree—however, whilst in *H. elegans* and *ruficollis*, this tooth is slightly emarginated at the apex, it is sharply notched in *H. bimaculata*, in fact bilobed, the lobes being large and rounded at the apex. I look upon this notch, which is sharp but not deep, as a mere variation from the emargination existing at the apex of the tooth of the former 2 species. (3) the palpi: these, the labial as well as maxillary, have their terminal joint truncated at the apex—and so far again all 3 species agree—however, whilst this joint is of elliptic form in the palpi of *H. ruficollis*, it is in *H. elegans* only so in the labial ones that of the maxillary ones being cylindric at the base. In *H. bimaculata* finally this joint is rather club-shaped or subtriangular and more strongly truncated than in the former 2 species. (4) the ligula: this organ is of subcoriaceous texture, middling size, the shape of an oblong square, free and transversely truncated at the apex—these characters are common to all 3 spec. and in *H. ruficollis* I have nothing to add to it; however, the anterior margin, which is straight in this species, is slightly bisinuated in *H. elegans* the outer angles being acute and the central one obtuse. The ligula of *H. bimaculata* differs from both the former in as far as it is narrowed towards the apex and depressed towards the sides and the front, the anterior margin is otherwise cut away straight, without any sinuosities, but it is rather strongly armed with bristles. The paraglossæ agree in all 3 spec. in as far as they are highly developed, reach much beyond the anterior margin of the ligula and are more or less bent inwards. Their greatest development they assume in *H. elegans* in which they nearly touch each other in front of the anterior margin, being cylindric and slender at the same time. In *H. ruficollis* the paraglossæ are somewhat shorter and straighter and in *H. bimaculata* still more so.

On all other points the 3 spec. perfectly agree, in saying which I lay particular weight upon the unusual sculpture of the elytra and the rather peculiar hairy vesture of the insects, bearing also in mind their general appearance, proportions, system of coloration, mode of living, etc. As to the hairy vesture of certain parts of the body and the sculpture of the elytra, it is true that these are not

generally looked upon as of much importance; however, they appear to me so in this instance, as they present certain unusual variations repeated in all 3 species. The hairy vesture consists in thin yellowish or reddish hairs thinly seminated over the back and still more thinly over the whole of the lower surface of the insects, being at the same time longer at the latter place. This vesture acquires its greatest density on the legs, especially the tibiæ and tarsi, whilst its uniform presence at the palpi forms almost a generic character. The elytra are exquisitely sculptured into about 8 larger costæ on either of them and into 2 smaller ones between every 2 of these; the furrows thus formed are finely transversely rugose and (with the exception of the central furrow between every 2 larger costæ) thinly pubescent.

It just strikes me that this sculpture of the elytra may occur in other Galeritidæ. If so, the insufficiency of my means to ascertain this fact to a certainty must plead my excuse for attaching undue importance to it. However, I should in this event consider my books of reference, none of which say anything to that effect, greatly (and indeed more than myself) at fault for not alluding to it, as in my opinion it is sufficiently peculiar to be mentioned.

After this lengthy preamble I shall have but a few words to say in finishing the description of the species.

46. *Heteroglossa elegans. N.*

H. supra rufo-castanea, capite obscuriore, maculis 2 humeralibus obsoletissimis ferrugineis; subtus dilutior, pedibus antennis oreque subtestaceis, elytris ad angulos apical. extern. testaceis; long. corp. $3\frac{1}{2}$ lin.

In lacus Colombensis ripis sub vegetab. putrescent. non infrequenter cepi.

An agile, pretty little insect of chocolate colour, and with its family features about it. Head smooth, polished, above and below slightly punctured, with 2 impressions in front of the eyes, anterior angles of labrum rather accuminated. Thorax deeper and more densely punctured than the head and with the elytra thinly hirsute, rather strongly emarginated in front, less so behind; sides, especially at the basal angles, depressed, divided longitudinally by a deep furrow.

Scutellum-like thorax punctured and hairy. Elytra with the inner apical angle right angled and the outer rounded off, largely punctured within the margin especially near the apex. Tibiæ with a row of larger spines down the outer and a row of smaller ones down the inner side, 4-calcarata at the apex, the 2 inner spurs larger.

47. *Heteroglossa ruficollis. N.*

H. colore præcedentis sed obscurior, thorace pectoreque rufo-testaceis, antennis art. 3 primis nigrescentibus; long. corp. $4\frac{1}{2}$ lin.

Cum præcedente sed rarius et per occasionem nocte ad lumen cepi.

The shape of the body is quite that of the former but the insect is larger. The head is less distinctly punctured than in the former and there is an additional impression in the middle of the forehead The thorax is also less deeply punctured, but the divisional furrow is more so than in the preceding species. The anterior tibiæ appear somewhat less deeply notched. There is nothing else to add to the description that has not been pointed out already.

48. *Heteroglossa bimaculata. N.*

H. subcastanea, thorace capiteque rufo-testaceis, elytris medio maculis 2 flavis pictis, pedibus abdominisque apice testaceis; long. corp. $5\frac{1}{2}$ lin.

Ubi præcedentes infrequentissime legi.

Head, with the exception of the forehead, deeply punctured, with 2 impressions in front of the eyes, anterior angles of labrum rounded. Thorax densely and deeply punctured, with elytra thinly pubescent. The latter with a round yellow spot at the middle of either.

Trib. Cratocerice.

Oosoma. n. g. N.

Corpus ovatum subconvexum, glabrum. Caput transversim subrbiculare, robustum; oculis magnis, ovatis, parum prominulis. Mentum profunde emarginatum, lobis extus rotundatis, apice subobtusis, dente minimo, obtuso. Ligula submembranacea minima, angustata, paraglossis maximis, connatis, ligulam totam amplec-

tentibus, apice leviter sed abrupte et sat profunde emarginatis. Palpi art. ult. ovato apice abruptius angnstato leviterque truncato. Clypeus subsemilunariter emarginatus. Labrum transversum profundins angulate emarginatnm, angnlis anter. rotnndatis, lateribus angnlato-rotundatum. Mandibulæ parvæ, validæ, edentatæ, inter med. et apic. arcuatæ. Antennæ robustæ, thoracis med. parum superantibus, art. 1 et 11 snbæqualibus, 2-10 parum brevioribus, subæqualibns, 1-3 basi angnstatis, reliquis ovatis, 5-11 leviter depressis. Thorax transversus, capite parnm latior, basi qnadratus, apicem versus leviter angustatus, antice vix emarginatus, postice leviter bisinuatus, elytris fortiter applicatus. Elytra basi quadrata, thoracis latitudine, apice oblique snbtrnncata, striata. Pedes validi fortiterque armati, snbæquales; tibiis costatis, ant. sat profunde emarginatis, apicem versns dilatatis, 4 post apice 4-calcaratis; tarsis art. 1-4 gradatim minoribus, ant. leviter dilatatis, art. 1° cylindrico-trigono, 2-4 trigonis, post. art. 1-4 subtus longitudinaliter biserratis.

Interesting insects apparently nearly allied to *Nothopus*, of an appearance which easily distinguishes them from any other Carabidæ I have hitherto met with in this Island: the head is plump, transversely orbicular, immersed up to the eyes in the thorax. The clypeus is narrow, transverse, rather deeply emarginated in the form of a crescent, ant. angles acuminated. The labrum is of thin, translucent texture, deeply angnlarly emarginated in front, the ant. angles rounded, setose, sides angular, rounded. Mandibles short and thick, cnrved from the middle to the tip, edentate. Maxillæ simple. Antennæ short, thick, reaching a little beyond the middle of the thorax, joints 3-11 pubescent, 5-11 slightly compressed, 1-3 narrowed at the base, 4-11 oval, 1 and 11, 2-10 of about equal length respectively. Mentum with a straight, deep emargination, lobes ronnded externally, rather obtnse at the apex, tooth very small, obtuse. Lignla very small, narrow, slightly dilated towards and rounded at the apex, paraglossæ very large, connate, enveloping the ligula on all sides, the whole slightly truncated at the ant. angles and slightly, but sharply and pretty deeply emarginated or notched at the centre of the ant. margin. Palpi, both maxill. and labial ones, with the terminal joint oval,

rather abruptly narrowed and slightly truncated at the apex; these characteristics more distinctly expressed in the labial ones. All the lower part of the mouth is situated in or forms a cavity. Thorax a little broader than the head nearly twice as broad as it is long, quadratic at the base, slightly narrowed towards the apex, ant. angles slightly produced, the ant. margin can hardly be called emarginated, 2 slight sinuosities at the base, firmly applied to the elytra and as broad as these. Scutellum broad, triangular. The elytra rather abruptly cut away at the apex, internal angles rather obtuse, slightly dehiscent. Legs stout and strongly armed, very much in the manner of my *Cyclosomus Dyticoides*, of which the insect under consideration in various respects reminds me most forcibly. The spines of the tibiæ are inserted on ridges, the ant. ones being dilated. The tarsi are all concave on the inner side. I have been unable to discover anything in them by which to distinguish the sexes, not even additional spines or bristles. However, the sexes appear well marked by the difference in size. The ant. tarsi are dilated, the intermed. and post. ones more and more elongated and the joints subcylindric; joint 1 of the latter is longer than the 3 following together, all 4 have the edges of their concave inner side serrated—an extraordinary circumstance. The highly developed prosternum reminds me again of *Cyclosomus*.

The habits of these insects are those of the *Amaras;* they live in dry, sandy places under grass and leaves; at certain times they take freely to their wings and *O. arenaria* may then be caught in great numbers at night about the light. This species is very common in all the dry and sandy parts of the neighbourhood of Colombo; the pretty little *O. Gerstæckeri*, however, is scarce.

49. *Oosoma arenaria. N.*

O. supra brunneo-ænea, subtus magis minusve brunnea, pedibus, palpis antennarumque basi testaceis, tarsis, labro limboque angustissimo obscurioribus; capite ad clypei marginem post. punctis 2-impresso; thorace ad basin obsoletissime 4-foveolato, linea longitud. abbreviata, indistincta, diviso, basi anticeque obsoletissime striguloso; subtus tenuiter hirsuta; long. corp. $2\frac{1}{2}$—3 lin., lat. $1\frac{1}{4}$—$1\frac{1}{2}$ lin.

50. *Oosoma Gerstæckeri. N.*

O. supra brunneo-ænea, sæpius glaucescens, elytris dorso dilute brunnescentibus maculis 4 longitud. irregularibus flavis pictis, subtus magis minusve brunnea, pedibus, antennis labroque testaceo-brunneis, palpis antennarumque basi testaceis; long. corp. $2\frac{1}{4}$ lin. lat. $1\frac{1}{8}$ lin.

Excepting in colour not essentially differing from the former. However, the marks of the thorax are more distinct, and the 4 obsolete pits are replaced by 2 longitud. impressions, the whole insect is, moreover, more graceful than the former. The maculæ of the elytra may be said to commence at the basal angles of the thorax which are of a similar, but less distinct, colour. The true humeral maculæ begin at the base of the elytra and stretch nearly to the middle as a thick straight line of narrow parallelogram the principal part of which occupies the 6th interstice a spot being thrown out on either side. The apical maculæ commence a little below the middle and are essentially composed of small squares heaped upon each other so as to form steps or an inverted pyramid.

As this design varies more or less in different individuals it can be of no importance to describe it in a more detailed manner, suffice it to say that apparently in no instance does any part of it reach either the inner or outer margin, the field upon which it is displayed being enclosed by the 1st and 7th stria. The brownish green metallic upper surface of the insect in some individuals throws off a fine blue reflex, very perceptible on head and thorax. The part of the back enclosed by the maculæ is washed out to a light brown with the exception of the suture which remains dark.

In naming this pretty species after Dr. Gerstæcker of the R. Museum, Berlin, I wished to pay that gentleman the only trifling compliment circumstances admit of in acknowledgment for various useful hints he has kindly communicated to me.

51. *Chlænius princeps. N.*

C. aureo-viridis, scutello cupreo, elytris nigro-viridibus ad basin et infra marginem viridibus, sutura nigra, subtus piceus, coxis trochanteribusque 4 ant. dilutioribus, femoribus trochanteribusque 2 post. testaceis, tibiis tarsisque obscurioribus, ore antennisque

brunneis, labro, mandibulis limboque castaneis; capite obsolete ruguloso, punctulato; antennis art. 3° quarti prope longitudine; menti dente forti laciniis apice rotundatis; thorace ovato-quadrato, latitudine parum lougiore, angulis ant. subrectis, post. rotundatis, basi fortiter 2-impresso, puuctato; scutello canaliculato; elytris striatis, in striis punctatis, ad strias, præsertim apicem versus, tenuiter pilosis; long. corp. 8 lin., lat. 3 lin.

Specimen singulum f. prope Colombo sub-lapidibus cepi.

A very haudsome species, distinguished by its size and comparatively great breadth. The clypeus is impressed with 2 setigerous pits near the ant. corners. The labrum is transverse, slightly situated in front, narrowed at the base and has the ant. angles strongly rounded off. The last joint of both the maxillary and labial palpi is cylindric and truncated at the apex, in the maxill. it is shorter than in the labial ones, in the latter somewhat narrowed at the base and slightly inflated at the middle, both appear slightly compressed at the apex. The elytra are strongly rounded at the apex. The insect has a very strong smell, somewhat like musk, about it.

52. *Chlœnius maleolens. N.*

C. capite, thorace scutelloque obscure cupreo-viridi-glaucescentibus, elytris obscurioribus, pubescentibus, maculis 2 subapicalibus flavis ornatis, subtus piceus, pedibus testaceis, ore autennisque brunneis, maudibulis limboque castaneis; capite ad clypei marginem post. profuudius 2 foveolato, punctulato, occipite leviter transversim ruguloso; antennis art. 3° quarto subæquali vel paulo breviore; menti dente apice leviter sinuato; thorace subquadrato, lateribus leviter rotundatis, profundius punctulato atque levissime transversim rugologo, ad basin 2-impresso, parce piloso; elytris densius pubescentibus, striatis, in interstitiis 3-8 utrinque ante apicem macula suborbiculari flava ornatis; long. corp. $6\frac{1}{4}$ lin.

Specimen singulum m. prope Colombo cepi.

Also a handsome and rare species, smelling strongly and disagreeably of creosote. Head, thorax and scutellum are of a dull bluish green colour with a copper reflex from the back; the elytra

are of a blackish green, pubescent and adorned with 2 yellow spots between the middle and apex; this is of irregular, rounded outline and stretches from the middle of the 3rd interstice across to the 8 stria. The 4th joint of the maxill. palpi is subcylindric, that of the labial ones larger, plump and rather triangular. Tooth of the mentum not bifid but truncated and merely slightly sinuated at the apex. The elytra are narrowed at the apex.

53. *Chlænius Dohrnii. N.*

C. elongatus, parallelus, capite thoraceque viridi-nitentibus, elytris viridi-glaucescentibus maculis 2 apicalibus flavis pictis, subtus dilute piceus, apicem versus brunneus, pedibus testaceis, ore antennisque brunneis; capite sublævi nitidissimo; antennis art. 2° parvo, reliquis longitudine subæquali; palpis maxill. art. 4° cylindrico, lab. eodem subtrigono; thorace ovato-quadrato, crebrius punctato, basi 2-impresso; elytris striatis punctatis, pubescentibus, 2-maculatis, maculis subapicalibus, prolongatis, interstitia 2-8 et angulum apicalem occupantibus, flavis; long. corp. 6 lin. lat. 2 lin.

Specimen singulum f. prope Colombo nocte ad lumen cepi.

The elongated and parallel shape of the body distinguish this species at first sight; it is very pretty and scarce, but has otherwise nothing remarkable in its construction. However, I may add to the above description that the mentum is large, the lobes obtuse at the apex and the tooth but slightly sinuated at the tip. The ligula is of the usual construction, the paraglossæ obtuse and ciliated at the apex. The 2 last joints of the labial palpi are rather elongated, whilst in the maxillary ones they are the reverse; the former have the terminal joint triangular, the latter cylindric, both are strongly truncated at the tip. The head is middling, with 2 impressions in front of the eyes; the mandibles are rather more curved than usual; the labrum is emarginated in front; the antennæ are rather short and stout reaching only to the base of the thorax. The latter is a little broader than the head and of an ovato-quadratic form. The elytra and legs are simple.

I have named this species after the president of the Entomol. Soc. of Stettin to whom I am indebted for much Entom. information.

54. *Harpalus (Ophonus) senilis. N.*

H. oblongo-ovatus, subdepressus, punctato-rugosus, griseo-pubescens, supra æneus, subtus piceus, ore pectoreque dilutioribus, pedibus testaceis, antennis basi palpisque apice flavis; capite robusto antice rotundato, postice parum angustato, thorace vix angustiore; antennis humeros attingentibus art. 2° parvo, reliquis longitudine subæquali; mandibulis obconicis, robustis, una unidentata, altera incisa; labro vix emarginato; palpis art. 4° ovato, apice abruptius angustato, leviter truncato; thorace transverso, longitudine tertia parte latiore, elytris vix angustiore, lateribus rotundato, infra med. leviter angustato, basi subquadrato, hic vix, antice leviter emarginato, angulis apicalibus obtuse acuminatis, basalibus subrecte rotundatis; elytris puncatto-striatis, apice fortius 2-sinuatis et angustatis; tarsis art. 4° cordato; long. corp. 4½ lin. lat. 1½ lin.

Prope Colombo sat copiosus.

This as well as the succeeding two species fly very commonly into the rooms at night during the rainy weather. The present spec. is a fine, comparatively large, robust insect. I may add to the above description that the emargination of the mentum is of middling size, its lobes rounded exterually and its tooth just marked in the shape of a slight obtuse rising at the bottom of the emargination. The ligula is very small and narrow, the paraglossæ very large, adhering to it and enveloping it fully and on all sides; the whole is very slightly cut away at the apical angles and slightly, but abruptly and rather deeply, notched at the centre of the anterior margin. I may further notice that some of the individuals before me have the apex of the maxill. palpi prolonged, cylindric and slightly bent inwards; as this is not a sexual distinction and as the insects thus distinguished differ in no other respect from the rest, I look upon them as curious varieties.

55. *Harpalus (Ophonus) rugosus. N.*

H. præcedenti simillimus sed sesqui minor, magis rugosus, antennis robustioribus art. 5-11 ovatis leviter depressis, colore supra parum obscuriore, subtus dilutiore, pedibus albidis, coxis tarsisque brunneis, antennis totis castaneis; long. corp. 3½ lin.

The small size and, upon close inspection, the other peculiarities

just pointed out readily distinguish this species from the former in spite of their close affinity in other respects. They are both equally common about Colombo.

56. *Harpalus (Selenophorus) Colombensis. N.*

H. statura præcedentis sed gracilior, glaber, supra læte æneus, subtus subcastaneus, pedibus albidis, coxis, tarsis, antennis palpisque testaceis, ore brunneo; capite transversim ruguloso; antennis præcedente tenuioribus, palpis gracilioribus apice magis angustatis; labro basin versus leviter dilatato; mandibulis infra apicem abruptius arcuatæ, una uni; altera bi-dentata; thorace lateribus præcedente minus rotundato, basi minus angustato, hic rugoso-punctato antice leviter longitudinaliter strigoso; elytris striatis, parce punctulatis, in interstitis 3°, 5° et 7° punctis majoribus impressis; long. corp. 3 lin.

Prope Colombo sat copiosus.

A pretty little insect, very distinct from the preceding two. I may add that it also differs somewhat in the paraglossæ the anterior angles of which are distinct.

Trib. Harpalidæ?

Lepithrix. n. g. N.

Corpus oblongum, robustum, subconvexum. Caput ovatum, mediocre; oculis semiglobosis prominulis. Mentum leviter subsemilunariter emargiuatum, lobis extus rotundatis, dente vel parvo, obtuso vel nullo. Ligula mediocris, coruea, oblonge quadrata, apice trausversim truncata, libera, paraglossis cylindricis apice truncatis, sat robustis, marginem ant. parum superantibus. Palpi articulo ultimo elliptico, truncato. Labrum apicem versus angustatum, apice rotundatum. Mandibulæ validæ, apice arcuatæ, una uni; altera bi-dentata. Antennæ filiformes humeros parum superantibus, art. 2° parvo, reliquis longitudine subæquali. Thorax mediocris longitudine parum latior, antice vix, postice haud emarginatus, lateribus leviter rotundatus, basi parum augustatus, angulis omnibus rotundatis, margine elevato. Elytra ovata, infra med. parum dilatata, apice leviter augustata et acuminata. Pedes subæquales, tibiis apice bicalcaratis, calcaribus intus subtiliter serratis,

ant. leviter emarginatis, tarsis 2 ant. art. 1-3 leviter dilatatis gradatim minoribus, art. 1° cylindrico, 2° obcordato, 3° trigono, omnes art. 4° *maris* bilobo, *feminæ* bifido, art. 5° magno, unguibus validis, simplicibus; *subtus* tarsis 2 ant. art. 1-4, intermed. art. 2°-4° squamularum longepedunculatarum seriebus duabus munitis.

57. *Lepithrix foliolosa. N.*

L. glabra, supra obscure brunnea thoracis elytrorumque limbo testaceo, subtus brunneo-testacea pedibus albidis, antennis art. 3 primis flavis reliquis nigrescentibus, palpis art. ultimo testaceo, reliquis flavis; thorace ad angulos basales profundius foveolato; elytris striatis; prosterno canaliculato; long. corp. 3-4 lin.

Specimina nonnulla mens. Octob. prope Colombo nocte ad lumen cepi.

The internal vesture of the tarsi of these otherwise inconspicuous insects constitutes their most important character and is altogether of a very interesting nature. I proceed at once to describe it at full length premising that *I believe* I have both male and female before me. The individual which I take to be the male is smaller and of a darker colour than the other. The legs, with the exception of the tarsi, are the same in both sexes. They are of middling strength, the tibiæ are furnished with 2 spurs at the inner side of the apex, which spurs are finely serrated along their inner edge, the tarsi have joints 1-3 of the first pair slightly dilated, the posterior pair is elongated, subcylindric and the intermediate one forms a passage between the two. Joints 1-3 of the first pair are gradually decreasing in size, joint 1 being at the same time subcylindric, joint 2 rather cordiform and joint 3 rather triangular, joint 4 in all 6 tarsi is bilobed in the male and bifid in the female, this character being, however, less distinctly expressed in the 2 post. tarsi than in the 4 ant. ones; joint 5 is large and the claws strong and simple, a membranaceous process of triangular form covers the base of the latter above.

The internal vesture of the 4 ant. tarsi of the *male* is of the following description. The inner part of joints 1-4 of the 2 ant. ones is furnished with 2 longitudinal series of peduncled squamulæ which are of a broad, triangular form and lie like tiles upon each

other covering the sole of the tarsus; they are flanked by bristles which partake of the nature of scales, being dilated in the shape of a lancet. These squamulæ are without any particular colour, they are unconnected amongst themselves, their edges are entire and they attain their highest development at the apex of the 4th joint; in fact their development is gradual from the base of the 1st joint to the apex of the 4th. The intermediate tarsi, although not dilated, are similarly provided as the anter. ones, but only at the apex of the 2nd and at the 3rd and 4th joint, the squamulæ being of rather a square shape triangularly prolonged and peduncled at the base; the 1st joint is naked in this pair.

The tarsi of the *female* are very much the same as those of the male, excepting the 4th joint which, as above mentioned, is bifid. A further distinction exists, however, in the squamulæ. In the 2 ant. tarsi of the female these are present at the apex only of the 1st and 2nd joint (hardly distinct at the former), however, they are well developed in the 3rd and very highly in the 4th joint, the squamulaceous bristles are less conspicuous but the peduncle attains extraordinary length in the 4th joint; the squamulæ do not cover each other like tiles, but stand more freely and loosely and are curved inwards so as nearly to touch in the middle; their shape is that of an elongated triangle, they are veined and their apical edge is serrated. Being such and placed upon long, slender, peduncles they forcibly remind me of the leaflets of certain ferns (Adiantum) and hence the specific name *foliolosa*. The intermediate tarsi are similarly provided, but, as in the male, the 1st joint is naked and the 2nd furnished at the apex only. The lower edges of the 2 posterior tarsi are very neatly fenced in with small closely set spines.

I feel doubtful as to the affinities of these insects, especially if in reality I have described both sexes and if the vesture of the intermediate tarsi is allowed to be of the same importance as that of the anterior ones; however, I think they must find a place amongst the Harpalidæ as restricted by Lacordaire. I must not omit to mention that the tooth of the mentum appears to be variable, one of my specimens (a male) being decidedly without it, whilst another is furnished with a small, obtuse one.

PROCEEDINGS

OF THE

ASIATIC SOCIETY OF BENGAL,

For March, 1857.

At a Monthly General Meeting of the Asiatic Society, held on the 4th instant.

The Hon'ble Sir James Colvile, President, in the chair.

Presentations were received—

1. From Mr. C. Gubbins, C. S., a collection of old bricks, chiefly dug out of the oldest Hindu forts and cities of the Mohábharut period, and in the vicinity of the residence of the Pandoo family.

The following is a list of the bricks, with the dates at which they were procured; to which are added several interesting notes upon some of the localities mentioned.

No. 1.—"Ruined Tank south of old Hindu town Coel, now called Alygurh; in the Meruth Division, 1856.

No. 2.—Buraire Tank, close to Bidjeegurh, 16 miles south of Alygurh or Coel, 1856.

No. 3.—Lowest bricks of the fort Coel at Alygurh, found from 15 to 20 feet below the surface, 1856.

No. 4.—Middle bricks of the old fort Coel at Alygurh, found 10 feet below surface, 1856.

No. 5.—The upper bricks of the old Hindu fort Coel, Alygurh, 1856, found some 5 feet below the present level of the ground.

The old Hindu fort of Coel is situated in the centre of the present town of that name; Alygurh proper, is the Musulman Fort, 2 miles north of the town, taken by storm under Lord Lake in 1803. The whole site of the old fort is built over, and the highest part is occupied by a mosque, and an imitation Kootoob minar. There are no Hindu buildings of antiquity in the vicinity.

No. 6.—Boolundshehur, otherwise Oonchagaon, 40 miles south of Meruth, 1849.

This is a very ancient and very high old Hindu fort. Its name (Boolund in Persian and Ooncha in Oordoo signifying "HIGH,") marks that it is the highest spot in the vicinity, in the level Gangetic valley. It is now occupied by native buildings which crown its summit, and cluster about its base.

No. 7.—A segment of circle used in the construction of wells at Boolundshuhur, otherwise called Oonchagaon, 40 miles south of Meruth, 1849.

No. 8.—Boolundshehur, 40 miles south of Meruth, a segment of a circle used for wells.

No. 9.—Meruth fort, Meruth Division, 40 miles N. E. of Delhi, 1849.

The fort of Meruth is in the centre of the populous modern town of that name, entirely occupied by native and European buildings. The natives now attribute the name to one Meroo or Meran, an attaché of the Mogul Court. But from the remains of the old system of Hindu wet ditch, connected with a dam across the river Hindun by a canal now called the Aboo nulla defence, similar to Bhurtpoor, to Mooltan, to Rohtuc and Coel, I have no hesitation in assigning to it a far more ancient date. When Timour diverged in order to capture this fort, it bore its present name, and the strata of gradual accumulation of soil alone shew, that its period must be estimated by thousands, not by hundreds of years.

No. 10.—Two bricks of Hustinapoor fort, on the banks of the river Ganges, North East of Meruth, 1849-50.

No. 11.—Acbar's Mosque, on the site of fort Hustinapoor, Meruth Division and district, 1848-49.

Having observed in several works in India of considerable merit and even of recent date a very mistaken notion of the locality of the ancient Hustinapoor, which is declared to be "on the Jumna," or "near the modern Delhi," I think it may be useful to correct this error, regarding a place of such former fame, though seldom visited by Europeans, because now devoid of any feature of interest.

This capital of the Pandoos was situated, not near the Jumna, but on the Ganges, about 50 miles north-east of Indrapressta the early

name of the rival city known to Europeans as Delhi. The site is now the centre of a large Dhak forest, as the debris and inequalities of the broken ground render it less favorable for agriculture than the surrounding country. So completely has all vestige of the old town disappeared, that the Hindus ascribe it to a miracle of the gods, who are said to have subverted the city, leaving the foundations uppermost. The only old buildings in the vicinity are a few Musulman tombs near, and the ruins of Acbar's mosque, on the mound of the old fort. A large Parisnáth temple, of recent erection, occupies the northern base of the mound. The name of Hustinapoor no doubt originated from the wild elephants, likely to have frequented the neighbourhood in the days of which tradition speaks, when the forest, still found fringing the hills to the eastward, extended unbroken beyond the Ganges into the Dooab; an epoch so extremely remote as to render it no matter of wonder, that not a relic remains of the former grandeur of this noted city: not a building or a fragment of a building remains, merely extensive mounds of rubbish interspersed with bricks of the larger size, distinctive of the early Hindu architecture. Even the extent of these mounds is now hardly to be distinguished, as they mingle with the raised broken ground that for many miles north and south of this spot marks the western edge of the course taken by the Ganges in former ages. The main river now rolls 15 miles farther east, but this intermediate space is entirely low alluvial soil traversed by numerous small water-courses, and liable to inundation in heavy rains: and immediately under the steep bank on which the fort of Hustinapoor is situated, creeps sluggishly a small branch that quitting the principal stream a little below Hurdwar rejoins about 40 miles lower at Gurmukhteesur, and still bears the name of the Boori-Gunga or old Ganges. That this small stream has intermediately been the main channel of the Ganges, is evident from the fact that only one-half of the fort mound now remains, the Eastern half having been entirely carried away by the river. During the three years that I was Magistrate and Collector of Meruth, I made every research to discover vestiges of Hindu occupancy, but failed to discover any thing antecedent to the Musulman era, save these bricks. The fact that this old site includes one of the holiest

Parisnáth shrines, would lead one to suppose that the ancient struggle between Pandoos and Koroos may have been a part of the religious contest which ended with the destruction of the Bhooddhist shrines throughout India.

No. 12.—Burnawa Fort on the river Hindron, in the district of Meruth, 1849. This is an extensive and very high mound occupying similarly to the fort at Allahabad the extreme tongue of land at the confluence of two streams. These are the chief tributaries of the river Hindun, losing their own names at this confluence. The new town of Burnawa is situated immediately to the north of the old fort mound of which the whole summit is now occupied by a Musulman shrine and cemetery. Copper coins of the early Mahomedan rule similar to those found at Canoge are occasionally turned up by the plough in the environs of the new town.

No. 13.—Ruins near Rohtuc, 40 miles west of Delhi.

No. 14.—Singpoora close by Rohtuc, 40 miles north of Delhi; destroyed by the bursting of the old canal in ancient times.

No. 15.—Singpoora near Rohtuc, 40 miles west of Delhi.

No. 16.—A, The old Khairahs west of Rohtuc, 40 miles west of Delhi. B, ruined site of Fort west of Rohtuc, 40 miles west of Delhi.

No. 17.—Singpoora or Jehangeerpoor, near Rohtuc, 40 miles west of Delhi.

The vicinity of Rohtuc presents the most curious collection of old sites and ancient mounds I have as yet had an opportunity of noting and examining in India.

The mounds immediately to the west of the present town are supposed by the natives to be the *most* ancient: the square bricks are dug out of those ancient vestiges. The ruins towards Singpoora to the north-west, are believed to be of much later date, but in themselves they present evidence of two periods of occupancy; the more ancient, affording bricks of the same pattern as those of Paniput, Burnawa, Hustinapoor, Mohabalipooram near Madras, and Sarnath near Benares. Only among these ancient remains, and at Sarnath have I found specimens of beautifully carved brick. I regret I have not been successful in obtaining for the society a specimen of the carved brick of Singpoora, of which I possessed

several in 1835, but an application to Mr. John Adam Loch, Magistrate of Rohtuc, through whose kindness I obtained the specimens now submitted, would, I feel sure, meet with immediate attention, if the Society should think it worth while. The specimen of the Sarnauth carved brick will be presented to the Society as soon as I receive it from Benares.

The site of Rohtuc is on the exact course of commerce and invasion into Northern India across the desert. A line of wells passing from the fords of the Sutlege at Pacputtun through Bhatneer, Sirsa, Hansie, Mehim, and Rohtuc were to the invading Musulman what the Russians have just constructed for themselves further north; the Hindus had sunk them for the convenience of commerce and social intercourse.* The second period of occupancy is evidently of not more than 5, 6, or 700 years date, and it is this town which is said by popular tradition to have been submerged by the unskilful construction of the former western canals under the Mussulman rule. Here houses were in 1832 standing with walls entire, and the deserted city formed an extensive government Grass preserve, tenanted at that period only by wolves and jackals, but where tigers had been found and shot by Col. James Skinner and Mr. William Fraser, when we first took possession of this territory.

No. 18.—Sonput Fort 20 miles north of Delhi: 1846.

The fort of Sonput is the centre of the populous town of that name.

No. 19.—Paniput Fort, Delhi Territory,—miles, south of Thanaisur, 1846.

The fort of Paniput is extensively built over and extremely elevated, forming part of the modern town of that name.

No. 20.—Thirwa Fort, 16 miles west of Kurnaul, Delhi Territory.

This place is entirely deserted, and situated in the midst of an extensive jungle. The fort mound is not far from a water-course supposed to have contained in former days flowing water through the greater portion of the year, but now only full during the rains.

Mr. Gubbins writes.

"Since forwarding this collection of ancient bricks, I have had an

* See Transactions, Royal Asiatic Society, Vol. I. p. 135.

opportunity of visiting the ruins of Sarnath. I found that the uncovered circular Souterrain, which is one of the most remarkable of the remains, is constructed of very perfect bricks similar in size and proportions to the long bricks of the Pandoo sites of the Mohábharut, and also to those at Mohabalipooram in Madras; as mentioned in the short account of the latter ruins published in the Society's Journal for 1853.

The bricks at Sarnath are not all precisely of the same size, but vary from $15\frac{1}{2}$ to $16\frac{1}{2}$ inches in length, and from $12\frac{1}{2}$ to $13\frac{1}{2}$ in width, and were found to be about three inches thick, ten of them *in situ* measured 33 inches. I am inclined to ascribe all the buildings, in the remains of which bricks of this type are found, to one nation, which at some remote period, about or before the era of Asoka, held sway from Mohabalipooram to Thanaisur certainly, and probably much further. I think the original dimensions of the brick mould was derived from the human cubit; that the outside of the mould was of that length, viz. 18 inches, and I infer from the fact that modern Parisnath or Suraogee (*not Brahminical*) temples are found on two of the principal of these sites, namely, Hustinapoor and Sarnath, and that these sites are still reverenced by the Suraogees, who perform pilgrimages to them from great distances, that this people was of the Buddhist, and not the Brahminical persuasion."

2. From the Government of Bombay through the Government of India,—copies of selections in the Political department, together with a Marine Chart.

3. From the Superintendent of the Geological Survey of India, and of the Geological Museum in Calcutta, a copy of the Memoirs of the Geological Survey of India, vol. 1. part 1.

Mr. Nietner of Ceylon, proposed and seconded at the last meeting, was elected a corresponding member.

The following gentlemen, duly proposed and seconded at the last meeting were ballotted for and elected ordinary members:—

Mr. H. F. Blanford and Mr. E. B. Cowell.

Baboo Joygopal Bysack, was proposed for ballot at the next meeting by Mr. Atkinson, seconded by Baboo Rajendralál Mittra.

The Council submitted the following report upon the proposition of Mr. Oldham, to reduce the subscription of non-resident members from Rs. 64 to Rs. 32 per annum.

REPORT.

"The Council having considered the proposals of Mr. Oldham for the reduction of the subscription of non-resident members of the Society from 64 to 32 rupees per annum, are unable to recommend the suggested alteration.

"However willing they might be to entertain the claim of members not residing at Calcutta, to some reduction of their contribution in consideration of the relative disadvantages under which they are placed as compared to the resident members of the Society, the financial position of the Society is not such as to authorise such a hazardous experiment at the present time.

"It will be evident, that if the subscriptions of non-resident members are *decreased* by one-half, that their numbers must be *increased* in just the same proportion to maintain the subscription list, at its present amount. Besides this too, the liabilities of the Society are directly increased by an increase in the number of the subscribers, for the journal has to be supplied to each of the new members gratis. At present there are 60 non-resident members; to countervail the reduction of their subscriptions 60 additional members must be got. The supply of the Journal to 60 new members would cause an additional charge of $60 \times 7 = 420$ Rs. A further increase of members would therefore be necessary to make up for this, and about 17 more subscribers would be required in addition to the 60 first mentioned, or in all 77 new members, a number not to be looked for within any definite period.

"The loss to the Society from the reduction of the subscription of 60 members from 64 to 32 Rupees, would be 1,920 Rs. per annum, and taking into account the charge for the Journal as above, Rs. 2,464 additional income must be obtained from new members at the reduced rate to keep the Society in its present position as regards available income.

"Neither does it appear at all certain to the Council, that the circumstance of their being less favourably placed as regards the use of the Society's Museum or Library or the management of its affairs, is really held to be an objection by a large proportion of the subscribers who are non-resident. Their contributions are given not with the expectation of obtaining any distinct equivalent in return, but solely to

forward the general objects of the Society, and the votes on the question of the reduction of the subscriptions of members generally which was lately raised, tend to shew that this is a correct view of the matter.

"In making this report to the Society, the Council think it but right to add, that a minority of their body would advocate the immediate reduction of the subscriptions as suggested by Mr. Oldham. This minority of the Council do not deny the possibility of some temporary falling off of the resources of the Society as a consequence of such a step, but having in view the altered conditions of Society in Calcutta during the last few years, and the extreme importance of strengthening the Society with new members, and enlarging its sphere of action to the utmost, they are convinced that the true policy for the Society to adopt is to throw down, as far as possible, all obstructions to its expansion, and to trust to an increased love of learning and science to enlarge the number of members and to make good any temporary falling off in the contributions which such a reduction might cause."

The President proposed, seconded by Baboo Ramgopal Ghose—

That the votes of the Mofussil members be taken on Mr. Oldham's proposition, and that a special meeting be convened for the final decision of the question, and be held after the ordinary general meeting of the Society on the first Wednesday in June.

Agreed to.

The Council asked permission to expend a sum not exceeding Rs. 1,200 in the purchase of additional cases for the Bird Room, on the recommendation of the Committee of Natural History.

Sanctioned.

The Council also reported that, on the recommendation of the same Committee, they had agreed to make the following additions and changes in the establishment for the Museum of Natural History.

That the wages of the present Taxidermist Mr. Swaris, Senior, be increased from Rs. 20 to Rs. 30, and of his Assistant, Swaris, Junior, from Rs. 15 to 20 per mensem, on condition that the Curator reports favourably of their work, and on the understanding that

Rupee 1 and Rupee $\frac{2}{3}$ respectively be deducted from their pay for every day of absence.

That an additional Taxidermist or Assistant be employed temporarily at a monthly charge not exceeding 30 Rs. and that a Mistri be employed regularly at wages not exceeding Rs. 10 per mensem.

Confirmed.

Communications were received—

1. From Mr. Assistant Oldfield sending copy of a Meteorological Register kept at the Office of the Secretary to the Government of the N. W. Provinces Agra, for the month of December last.

2. From the Government of India through Colonel Birch, Secretary in the Military Department, forwarding copies of reports by Messrs. H. Schlagintweit on the proceedings of the Magnetic Survey.

3. From Baboo Rádhánath Sickdár, forwarding an abstract of the Meteorological Observations taken at the Office of the Surveyor General in the month of December last.

The Librarian submitted his usual monthly report for the month of February last.

Mr. R. Jones then exhibited a Wheatstone's Gyroscope (a modification of Foucault's Gyroscope.)

Mr. Jones explained the mechanism of the instrument and performed some experiments by means of it.

On the motion of the President the thanks of the Meeting were voted to Mr. Jones for his interesting exhibition.

Library.

The library received the following accessions during the month of February.

Presented.

Selections from the Records of the Bombay Government.

No. I.—Report on the plan of Survey and Assessment for Khandesh.—By the Government of Bombay.

Ditto No. II.—On ditto ditto for Rutnagherry.—By the Same.

Ditto No. III.—On the Zillah of Barochee.—By the Same.

Ditto No. IV.—On the Village Communities of Deccan.—By the Same.

Ditto No. V.—On the Badamee and Bagulkote Talooks, Belgaum Collectorate.—By the Same.

Ditto No. VI.—On the Kownace Talooka, Nassick Collectorate.—By the Same.

Ditto No. VII.—On the Management of Canals and Forests in Scinde.—By the Same.

Ditto No. VIII.—On the District of Sahitee.—By the Same.

Ditto No. IX.—On a claim to the village of Modugay, in Belgaum Collectorate.—By the Same.

Ditto No. X.—On the Ahmedabad Collectorate and on the portions of the Duskroee Purgunnah, Ahmedabad and Kuira Collectorates.—By the Same.

Ditto No. XI.—On certain Purgunnahs in Ahmedabad and Koraira Collectorates.—By the Same.

Ditto No. XII.—On certain Talooks in the Dharwar Collectorate, and on the History of the Chickodee District, Belgaum Collectorate.—By the Same.

Ditto No. XIII.—On the districts lately resumed from Meer Alli Moorad, in Sindh.—By the Same.

Ditto No. XV.—Relative to the Resumption of certain villages and lands, held by the late Anajee Nursew.—By the Same.

Ditto No. 1.—New Series.—On the Supply of Water to Bombay.—By the Same.

Ditto No. 2.—On the Southern Districts of the Surat Collectorate.—By the Same.

Ditto No. 3.—On the Settlement of Farm lands in Bombay.—By the Same.

Ditto No. 4.—On the Collectorate of Sholapore and Statistical Report of Cambay.—By the Same.

Ditto No. 5.—On the ditto of Ahmedabad and a short account of the Choota Tribe.—By the Same.

Ditto No. 7.—Statistical Report on the Colaba Agency.—By the Same.

Ditto No. 8.—Ditto on the Principality of Kolhapoor.—By the Same.

Ditto No. 10.—Memoir on the Sawant Warn State and Report on the Portuguese Settlements in India.—By the Same.

Ditto No. 11.—Ditto on the Sanitary State and Requirements of Bombay.—By the Same.

Ditto No. 12.—Miscellaneous Information of the Mahee Kanta.—By the Same.

Ditto No. 13.—History of Sind, A. D. 710 to 1590, being a translation of Mahmood Masoom Namé, by Capt. G. Malet, 3rd Regt. Bombay Light Cavalry.—By the Same.

Ditto No. 14.—Physical Character of the Nerbudda River and Mineral Resources of the Nerbudda Valley.—By the Same.

Ditto No. 15.—Miscellaneous Information connected with Kutch.—By the Same.

Ditto No. 16.—Tours for scientific and economical Research made in Guzerat, Kattiawar, and the Cunkuns.—By the Same.

Ditto No. 17.—Miscellaneous Information connected with the Province of Sind, Part I. and Part II.—By the Same.

Ditto No. 18.—On the Revenue Settlement of ditto.—By the Same.

Ditto No. 20.—Memo. on the water of Nullas in Jungle Districts.—By the Same.

Ditto No. 21.—Relating to the Assessment of the Omercote and Narra districts, in Sind.—By the Same.

Ditto No. 22.—Second Report on the Supply of Water to Bombay.—By the Same.

Ditto No. 23.—Miscellaneous Information connected with the petty states in the Rewa Kanta, in Guzerat.

Ditto No. 24.—Ditto connected with the Persian Gulf.—By the Same.

Ditto No. 25.—Ditto ditto native states under the control of the Political Superintendent of Pahlunpoor.—By the Same.

Ditto No. 26.—Ditto ditto with the petty states of Junjeera, Jowar, Sucheen, Dhurumpoor, Bunsda, Cambay, Penth, and the native states in the Khandesh Collectorate, with a Map of each Estate —By the Same.

Ditto No. 27.—Memorandum on Municipal Conservancy in the districts of the Bombay Presidency, Sind and Suttara.—By the Same.

Ditto No. 28.—Correspondence illustrative of the practice of the Peshwar's Government regarding adoptions,and the circumstances under which adopted sons could succeed to property held for the State.—By the Same.

Ditto No. 29.—Ditto regarding the concealment by the hereditary officers and others of the Revenue Records of the former Government and the Remedial Measures in progress.—By the Same.

Ditto No. 30.—Ditto exhibiting the nature and use of the Poona Duftur. A Selection of Paper on the origin of the Indian Commissariat.—By the Same.

Ditto No. 31.—Ditto, the results of the Scrutiny of the ditto.—By the Same.

Ditto No. 32.—Correspondence relating to the Canal clearances in the Hydrabad Collectorate in 1854-55. A Map accompanying.—By the Same.

Ditto No. 33.—Papers relating to a project for wet and dry docks in the Harbour of Bombay.—By the Same.

Ditto No. 34.—Correspondence on the abolition of Statute or forced Labour in Sind.—By the Same.

Ditto No. 35.—On the Hilly Region forming the Western part of the Kurrachee Collectorate.—By the Same.

Ditto No. 36.—Correspondence regarding the Fordwah in the Shakarpoor Collectorate, Sind.—By the Same.

Ditto No. 37.—Miscellaneous Information connected with the Province of Kattywar in Guzerat, with 3 maps.—By the Same.

Ditto No. 38.—Province of Kaleewah.—By the Same.

Ditto No. 39.—Reports on the Province of Kattywar and the ceded districts in Guzerat, &c. Part I. On the Proceedings adopted for the suppression of Infanticide in Kattywar, Part II.—By the Same.

Chart on Mercator's Projection for the use of Ships making the Port of Bombay, compiled from the Surveys of Lieuts. Cogan, Robinson, Ethersey, Mountrio, and Selby, Indian Navy, by Lieut. Fergusson.—By the Same.

General Description and Sailing Directions for the Coast of Kattywar, by A. M. Grieve, Lt. I. N. and Surveyor, *Bombay*, 1855.—By the Same.

Report and Directions of Ports of the N. E. Coast of Arabia, Surveyed in the years 1845 to 1849, by Lt. A. Grieve.—By the Same.

Sailing Directions for the Gulf of Kutch, by Lieut. A. D. Taylor, I. N. —By the Same.

Selections from the Records of the Government of India No. XX. Reports on the Province of Pegu, the district of Tounghoo, Journal of a trip from Tounghoo to the Salween River, &c. &c. &c.—By the Government of India, Foreign Department.

——— from the Records of Government, North Western Provinces, Part XXIX.—By the Government of the N. W. P.

General Report on the Administration of the several Presidencies and Provinces of British India during the year 1855-56, Parts I. and II. two copies.—By the Government of India.

Memoirs of the Geological Survey of India, Vol. I. Part I.—By T. Oldham, Esq. Superintendent of the Geological Survey of India.

Journal of the Photographic Society of Bengal, Nos. I. and II.—By the Society.

Journal Asiatique, Tome VIII. No. 31, Sept. and Oct. 1856.—By the Asiatic Society of Paris.

Journal of the Statistical Society of London, Vol. XIX. Part IV. Dec. 1856.—By the Society.

The Quarterly Journal of the Geological Society, Vol. XII. No. 48, Nov. 1856.—By the Society.

Catalogue of Mollusca in the Government Central Museum, *Madras.*—By the Curator of the Museum.

——— of the Shells for sale.—By the Curator.

Bijdragen tot de Taal-Land-en Volkenkunde van Neerlandsch Indie, Erste Deel. Nos. 3 and 4.—By the Royal Institute of History, Geography and Ethnology of Netherland's India.

Report of the Calcutta Public Library for 1856.—By the Curators of the Calcutta Public Library.

The Oriental Baptist for February, 1857.—By the Editor.

The Christian Spectator for January, 1857.—By the Editors.

The Calcutta Christian Observer for February, 1857.—By the Editors.

The Upadeshák for ditto ditto.—By the Editor.

The Durbin Newspaper for ditto ditto.—By the Editor.

The Morning Chronicle for ditto ditto.—By the Editor.

The Phœnix for ditto ditto.—By the Editor.

Exchanged.

The Athenæum for November, 1856.

Purchased.

Dissertations and Miscellaneous pieces relating to the History and Antiquities, the Arts, Sciences, and Literature of Asia, in 3 vols. 8vo. 1786, *London.**

A view of the English Interests in India, by W. Fullarton, 8vo. *London.*

History of the Revolt of Ali Beg against the Ottoman Porte, including an account of the form of government of Egypt; together with a description of Grand Cairo, and of several celebrated places in Egypt, Palestine and Syria, by S. L. *London,* 1784, 8vo.

A Review of the Proceedings at Paris, by M. Fennell, 8vo.

Rambles and Recollections of an Indian Official, by Lt.-Col. W. H. Sleeman, 2 vols. Royal 8vo. *London,* 1844.

Northern Mythology, comprising the principal popular Traditions and Superstitions of Scandinavia, North Germany, and the Netherlands, by Benjamin Thorpe, in 3 vols. 8vo. *London,* 1852.

Westwood's Arcana Entomologica, 2 vols. 8vo.

Architectural Ornament of all Nations exemplified in a series of Original Designs displaying the characteristic features of every class of Decorative Enrichment, 48 plates, by George Phillips.

Comptes Rendus, Nos. 16 to 21.

The Literary Gazette, Nos. 39 to 42.

The Annals and Magazine of Natural History, No. 108, for Dec. 1856.

* These papers are all from the volume of the Asiatic Researches.

Revue des Deux Mondes, 15th Nov. and 1st Dec. 1856.

Revue et Magasin de Zoologie, No. 10.

Revue Contemporaine et Athenæum Français, 15th and 30th November 1856.

Annuare des Deux Mondes histoire Générale des divers etats, 1855-56, *Paris.*

The American Journal of Science and Arts, No. 66, Nov. 1856.

Journal des Savants for October, 1856.

Analectes sur l'Histoire et la Littératur des Arabes d'Espagne par Al-Makkari, Tome Premier, seconde Partie, *Leyde*, 1856, 4to.

Schöns Vocabulary of the Hanssa Language with Grammatical Elements, *London*, 1843, 4to.

Gour Das Bysack.
Librarian and Assistant Secretary.

For April, 1857.

At a monthly general meeting of the Asiatic Society, held on the 1st instant.

The Hon'ble Sir J. Colvile, Knight, President, in the chair.

Presentations were received—

1. From His Highness Meer Hossein Ali Khan, Ex-Ameer of Scinde, through Major C. V. Bowie, Superintendent of the Ex-Ameers, a number of skins and heads of tigers, &c. a list of which is subjoined.

Tiger Skulls,	16
Sambur frontlets with horns,	5
Axis ditto ditto,	7
Muntjae,	1
Four horned antelope ditto ditto,	1
Nil-gai ditto ditto,	1
Tiger Skins,	15
Stuffed Tiger,	1
Ditto Bear (Ursus labiatus),	1

2. From Mr. W. H. Hoppner of the Survey Department, through Major Thuillier, a small number of copper coins found in Scinde near Hydrabad. The following is the note from the donor :—

"The accompanying old coins were picked up by a party of my Khalassees, when I was employed on the Scinde Survey in 1847. They are from the ruins of an ancient city now known amongst the Scindians as Bamrha-ke-Shool, or Brahminabad, some forty or fifty miles north-east of Hyderabad. The ruins afford evident traces of a walled city, about three quarter miles long, by half a mile wide. The people about the place assert that a wide river once flowed to the east of the city, of which the banks are still discernible, but which I failed to discover, though an extensive plain of sand lies on the North, East and South of the ruins. In the ruins themselves one wall, about fifty feet high, was still standing."

3. From Mr. W. Clark, through the same gentleman, a silver and copper coin dug up at Arrah in Behar.

4. From the Right Hon'ble the Governor in Council at Bombay, through Lieut. E. P. Fergusson, Superintendent, copies of the magnetical and meteorological observations made at the Bombay Observatory in 1854 and 1855.

5. From the Librarian to the Royal Bavarian Academy of Sciences at Munich, the latest publications of the Academy.

6. From Mr. W. H. Carey, Roorkee, copies of his Almanac and Annual Directory and Calendar of the Punjab, the N. W. Provinces and Oude, for 1857.

7. From Colonel Sir A. Bogle, a copy of the Maulmain Almanac for 1857.

Read letters—

1. From Mr. B. H. Hodgson, submitting for the information of the Society, and the public in general, the following extract from a letter from the Secretary to the Royal Asiatic Society in reference to the mountain Deodhanga ("Mount Everest" of Col. Waugh.)

Your letter of the 27th October, together with your observations on the incongruity of assigning a European name to Indian localities, already provided with native appellations, was received and read at our last meeting of the 17th instant, and I have the pleasure to inform you that the members present unanimously expressed their concurrence with your view of the case.

A notice of the paper was communicated to the *Athenæum* and *Literary Gazette*, and has appeared already in full in the latter journal.

I have, &c.,

EDWARD NORRIS,
Sec. Royal A. S.

To B. H. HODGSON, ESQ.

2. From the Secretary to the Royal Asiatic Society, enclosing a copy of a notification offering a prize of a sum of £300 presented by a gentleman lately of the Civil Service, for the best history and exposition either in German or French of the Vedanta system, both as a system of Philosophy and of Religion.

3. From Major Thuillier, forwarding the following extract of a letter from Lieut. Tennant, with a paper of calculations extracted from the Roorkee Almanac, relating to the annular solar eclipse of September 18th, 1857.

Camp Satgarra, Jan. 5th, 1856.

MY DEAR THUILLIER,—I have just received these from Roorkee (slips from the Roorkee Almanac and Directory for the N. W. Provinces), and I send you a couple of copies.

If you take any interest in them, pray keep one for yourself. The second I should be obliged if you would give to the Asiatic Society. I should be glad to have good observations, not only of times (which are in my special line), but of the *Hygrometer;* if possible both. The latter alone would be of little use to me, as I do not deal in those things; but Schlagintweit will be glad of them, and also Photometric observations. Perhaps the Society could call attention to the subject (if they have not done so) as the time comes near.

Yours very sincerely,

F. TENNANT.

ANNULAR SOLAR ECLIPSE.

SEPTEMBER 18TH, (Greenwich 17th,) 1857.

Calculated Positions of the Central and Limiting Lines for the Annular Appearance within Indian Longitudes.

Southern Limit.				Central Line.				Northern Limit.			
Lat. N.		Long. E.		Lat. N.		Long. E.		Lat. N.		Long. E.	
deg.	min.	deg.	min.	deg.	min.	deg.	min.	deg.	min.	deg.	min.
35 :	28·7	66 :	59·4	36 :	5·4	67 :	17·2	36 :	42·5	67 :	34·3
34 :	10·2	70 :	50·0	34 :	45·1	71 :	9·8	35 :	20·3	71 :	28·9
32 :	51·0	74 :	4·7	33 :	24·3	74 :	25·8	33 :	57·6	74 :	46·8
31 :	32·2	76 :	52·4	32 :	3·9	77 :	14·7	32 :	35·7	77 :	36·9
30 :	13·8	79 :	19·6	30 :	44·1	79 :	42·9	31 :	14·5	80 :	6·1
28 :	55·7	81 :	31·0	29 :	24·5	81 :	54·9	29 :	53·6	82 :	18·8
27 :	38·1	83 :	29·0	28 :	5·7	83 :	53·6	28 :	33·2	84 :	18·1
26 :	20·6	85 :	16·3	26 :	47·0	85 :	41·3	27 :	13·7	86 :	6·4
25 :	3·4	86 :	54·6	25 :	28·9	87 :	20·0	25 :	54·4	87 :	45·4
23 :	46·4	88 :	25·5	24 :	11·1	88 :	51·0	24 :	35·5	89 :	17·0
22 :	30·4	89 :	49·7	22 :	54·0	90 :	15·6	23 :	17·7	90 :	41·5
21 :	14·2	91 :	8·4	21 :	37·1	91 :	34·5	22 :	0·0	92 :	0·7
19 :	58·4	92 :	22·6	20 :	20·5	92 :	48·9	20 :	42·7	93 :	15·3
18 :	42·8	93 :	32·9	19 :	4·3	93 :	59·3	19 :	25·9	94 :	25·7
17 :	27·5	94 :	39·9	17 :	48·6	95 :	6·3	18 :	9·8	95 :	32·8
16 :	12·3	95 :	44·1	16 :	33·0	96 :	10·6	16 :	53·5	96 :	37·2
14 :	57·1	96 :	46·0	15 :	17·4	97 :	12·6	15 :	37·6	97 :	39·2
13 :	42·8	97 :	46·6	14 :	2·5	98 :	13·1	14 :	22·5	98 :	39·7
12 :	27·4	98 :	45·4	12 :	47·4	99 :	11·9	13 :	7·3	99 :	38·5
11 :	12·6	99 :	43·2	11 :	32·5	100 :	9·9	11 :	52·3	100 :	36·6

N. B.—Observations with the true times and Geographical position of the place will be very acceptable.

J. F. TENNANT, *Lieut. Engineers,*
1st Asst. Gt. Trig. Survey of India.

PREDICTED PHASES OF ECLIPSE OF SEPT. 17TH, 1857.

Place.	Nature of Eclipse.	Phases.	Mean Times. Greenwich.	Mean Times. Local.	Angle of Position from O's N. pt.	Angle of Position from ⊙'s vertex.	Magnitude of greatest Eclipse.
				PUNJAB.			
Murree.	Annular.	1st Contact,.....	h. m. 14: 46·9	h. m. 19: 40·5	deg. 53 W.	deg. 39 W.	Annular.
		Annulus forms,.	16: 0·7	21: 0·6			
		Ditto breaks, ...	16: 10·3	21: 3·9			
		Last Contact, ...	17: 31·8	22: 32·4	133 E.	154 E.	
Mooltan.	Partial.	1st Contact,.....	14: 48·7	19: 41·1	47 W.	10 E.	0·860 on N. Limb.
		Greatest eclipse,	16: 9	21: 1			
		Last Contact, ...	17: 42·3	22: 34·7	128 E.	159 E.	
Ferozepore.	Partial.	1st Contact,.....	14: 48·6	19: 46·9	48 W.	6 W.	0·915 on N. Limb.
		Greatest eclipse,	16: 14·	21: 12·			
		Last Contact, ...	17: 48·8	22: 47·1	130 E.	158 E.	
				N. W. PROVINCES.			
Mussooric.	Partial.	1st Contact,.....	14: 52·3	20: 4·5	49 W.	5 W.	0·963 on N. Limb.
		Greatest eclipse,	16: 18·0	21: 30·			
		Last Contact, ...	17: 52·6	23: 4·8	133 E.	154 E.	
Agra.	Partial.	1st Contact,.....	14: 54·7	20: 6·8	43 W.	6 E.	0·837 on N. Limb.
		Greatest eclipse,	16: 21·	21: 33·			
		Last Contact, ...	17: 57·4	23: 9·5	129 E.	150 E.	
Lucknow.	Partial.	1st Contact,.....	14: 58·2	20: 21·9	43 W.	12 W.	0·900 on N. Limb
		Greatest eclipse,	16: 27·	22: 51·			
		Last Contact, ...	18: 4·0	23: 27·7	132 E.	139 E.	
Benares.	Partial.	1st Contact,.....	15: 2·1	20: 34·1	43 W.	17 W.	0·900 on N. Limb.
		Greatest eclipse,	16: 33·	22: 5·			
		Last Contact, ...	18: 11·0	23: 43·3	133 E.	142 E.	
				BENGAL.			
Rampore Beauleah.	Annular.	1st Contact,.....	15: 13·6	21: 8·1	47 W.	22 W.	Annular.
		Annulus forms,.	16: 42·8	22: 37·3			
		Ditto breaks, ...	16: 45·9	22: 40·4			
		Last Contact, ...	18: 23·1	24: 17·6	140 E.	138 E.	
Calcutta.	Partial.	1st Contact,.....	15: 12·2	21: 5·6	42 W.	9 W.	0·930 on N. Limb.
		Greatest eclipse,	16: 47·	22: 40·			
		Last Contact, ...	18: 27·4	24: 20·8	137 E.	131 E.	
				PEGU.			
Rangoon.	Annular.	1st Contact,.....	15: 35·1	22: 0·1	44 W.	7 E.	Annular.
		Annulus forms,.	17: 13·0	23: 38·0			
		Ditto breaks, ...	17: 17·0	23: 42·0			
		Last Contact, ...	18: 55·0	25: 20·0	137 E.	88 E.	

MEMORANDUM.—The day is considered as commencing at Noon, and the hours are measured continuously to 24th. September 17d. 0h. is therefore Noon on the 17th September.

19h. is 7 A. M. on the 18th.
24h. is Noon do. do.
25h. is 1 P. M. do. do.

Babu Joygopaul Bysack, duly proposed and seconded at the last meeting, was balloted for and declared elected.

The following gentlemen were named for ballot at the next meeting:—

Dr. W. C. B. Eatwell proposed by Dr. Thomson and seconded by Dr. Boycott.

Rájah Prásúnonáth Rái Bahádur, of Degaputtee in Rajshahye, proposed by Mr. Grote, and seconded by Mr. Atkinson.

The council submitted a report announcing that they had elected the Venerable Archdeacon Pratt a member of their body in the place of Dr. Walker, who had proceeded to Europe, and that they had added the names of Dr. Röer and Mr. Cowell to the Philological Committee, and that of Mr. Blanford to the Committee of Natural History.

Babu Rajendralál Mitra exhibited an Indo-Scythian gold coin with a Greek legend of the type figured by Professor Wilson in the Ariana Antiqua (Plate XIV. fig. 2) but differing in the figure on the reverse having a javelin in the right hand and a sword in the left instead of the sword alone. The legend is Μιορο and not Μιρο as in Professor Wilson's coin. The name of the king (Oorki) on the obverse is perfectly distinct, and with the exception of the last two letters of the title (Korano) the whole of the inscription is legible. The coin was found in the village of Manickgunge (District Rajshahye) on the estate of Babu Ramananth Tagore and forwarded by that gentleman for exhibition to the meeting.

The Librarian submitted his usual monthly report.

Archdeacon Pratt, at the request of the President, explained with the help of diagrams the physical cause of the motion of the gyroscope, which was exhibited by Mr. Jones at the previous meeting; and afterwards illustrated by it the phenomenon of the precession of the Equinoxes, shewing its cause and the interest attaching to it, historically and scientifically, and in its bearing on Chronology. Under this last aspect Mr. Pratt showed, among other examples—

How an approximation might be made to the dates

(1) of the formation of the "Lunar Mansions," the earliest division of the Zodiac.

(2) of the age of the Vedas.

(3) of the Argonautic expedition. And

(4) of the time of Thales.

The best thanks of the meeting were voted to the lecturer, on the motion of the President, for his elucidation of these interesting subjects.

Mr. H. Schlagintweit exhibited some panoramic drawings which he had lately made in the neighbourhood of Kathmandu. These illustrations were accurately drawn to scale, and faithfully represented the appearance of the Himalayan range as seen from the valley of Nepaul.

The thanks of the meeting having been voted to Mr. Schlagintweit, the proceedings terminated.

Library.

The library received the following accessions during the month of March.

Presented.

Untersuchungen uber die Fauna Peruana von J. J. von Tschudi. *St. Gallen*, 1844-46, *folio*.—By the Author.

Memorie della Reale Academia delle Scienze di Torino, Seric Seconda Tomo XV. Torino, 1855 Bengal. 4to.—By the Academy.

Geschichte Wassaf's. Persisch Herausgegeben und deutsch übersetzt von Hammer-Purgstall 1 Band, 4to. Wien, 1856,—By the Author.

Sanskrit—Wörterbuch Herausgegeben von der Kaiserlichen Akademie der Wissenschaften, bearbeitet von Otto Böhtlingk und Rudolph Roth. Zweiter Theil, Bogen 1-10 and 11-20.—By the Authors.

Transactions of the Royal Irish Academy, Vol. XXIII. Part I. Science, Royal 4to.—By the Academy.

Proceedings of the Royal Irish Academy for the year 1855-56, Vol. VI. 8vo. Part III. 8vo.—By the Same.

The Journal of the Royal Geographical Society with Maps and Illustrations, Vol. XXIII. 1853, 8vo.—By the Society.

General Index to the Second ten volumes of the Journal of ditto.—By the Same.

Philosophical Transactions of the Royal Society of London for the year 1856, Vol. 146, Part I. Royal 4to., London.—By the Society.

Proceedings of ditto, Vol. VIII. No. 22.—By the Same.

Recueil des Actes de l'Académie imperiale des Sciences, Belles-Lettres et Arts de Bourdeux, 1855, 1—4 Tremestre, 1855.—By the Academy.

The Report of the British Association for the Advancement of Science, 1855, Glasgow.—By the Association.

Magnetical and Meteorological Observations, made at the Hon'ble East India Company's Observatory, Bombay, 1854 and 1855.—By the Govt. of Bombay.

The Almanac and Companion for the North-Western Provinces and the Punjaub for the year 1857.—By W. H. Carey, Esq., Roorkee.

Directory and Calendar for the N. W. P. and Punjaub and Oude for 1857.—By the Same.

The Tenasserim and Martaban Almanac and Directory for 1857, corresponding with the Burmese month and day for 1218-19.—By Sir A. Bogle.

The Oriental Baptist for March, 1857.—By the Editor.

The Oriental Christian Spectator for February, 1856.—By the Editor.

The Calcutta Christian Observer for March, 1857.—By the Editors.

The Upadeshak for ditto.—By the Editor.

Report of the Association of Friends for the promotion of Social Improvements in Bengal.—*Calcutta*, 1857.—By the Association.

Journal of the Royal Asiatic Society of Great Britain. Vol. XVI. Part II.—By the Society.

Abhandlungen der Mathemat-Physik classe der Koeniglich, Bayerischen Akademie der Wissenschaften. Band VII. Abth. 3. *Munchen*, 1855.—By the Academy.

Ditto der Historischen classe. Ditto Band VII. Abth. 1. Band VIII. Abth. 1.—By the Same.

Bulletin, 1853. Nos. 26 to 52.—By the Same.

Ueber die Bewegung der Bevölterung, von Dr. von Hermann.—By the Same.

Redc. von F. Thiersch.—By the Same.

Wegweiser für die Besucher des K. Botanischen gartens in München, von Dr. C. Fr. Ph. v. Martius, 12mo. 1852, *Munchen*.—By the Same.

Exchanged.

The Athenæum for December, 1856.

Purchased.

Conchologia Iconica: or illustrations on the Shells of Molluscous Animals, by Lovell Augustus Reeve. Vol. III.—Containing Monographs of the Genera Haliotis, Mangelia, Purpura, Ricinula, Monoceros, Bullia, and Buccinum.

Ditto Vol. IV.—Containing Monographs of the Genera Chama, Chiton, Chitoncllus, Ficula, Pyrula, Turbinella, Fasciolaria, Fusus, Paludomus, Turbo.

Ditto Vol. V.—Ditto ditto, Bulimus, Achatina, Dolium, Cassis, Turritella, Mesalia and Eglisia, Cassidarea, Oniscia, Eburna.

Ditto Vol. VI.—Voluta, Fissurella, Partula, Achatinella, Artemi, Lucina, Hemipecten, Oliva, Strombus, Pterocera, Rostellaria, Struthiolaria.

Ditto Vol. VII.—Ditto ditto, Helix.

Ditto Vol. VIII.—Ditto ditto, Pecten, Hinnites, Mactra, Lutraria, Amphidesma, Mesodesma, Donax, Patella, Nassa.

Ditto Vol. IX.—Ditto ditto, Spondylus, Neritina, Natica, Navicella. Siphonaria, Nerita, Latea.

Smith's Illustrations of the Zoology of South Africa (the deficient Nos. to complete the set of the Library, vide Catalogue, No. 777) Nos. 19 to 28.

Sowerby's, G. B., Thesaurus Conchyliorum, or Figures and Descriptions of recent Shells: (the deficient Nos. to complete the set, vide: No. 661 of Catalogue,) Parts 5 to 16, Vols. 1 and 2. Royal 8vo., London.

The Annals and Magazine of Natural History from September, 1840 to February, 1841, (the deficient Nos.)

Ditto ditto, No. 109, January, 1857.

Rig Veda oder die heiligen lieder der Brahmanen. Herausgegeben von Max Müller, Erste Lieferung Erster Thiel, *Leipzig*, 1856, Royal 4to.

Williams's Sakoontala.

Yajur Veda, Vol. II. part 8, and Vol. III. part 1, 20 copies each.

The Book of Jonah in four Semitic versions, viz. Chaldee, Syriac, Aethiopic, and Arabic, with corresponding Glossaries, by W. Wright, 1857, 8vo.

Catalogue of Stars near the Ecliptic, observed at Markree during the years 1854, 1855 and 1856, and whose places are supposed to be hitherto unpublished, Vol. IV. containing 14,951 stars, 1856.

Journal des Savants for November and December, 1856.

Literary Gazette, Nos. 43 and 44 of 1856, and Nos. 2085 and 2086 for 1857.

Revue et Magazin de Zoologi, No. 11.

Annales des Sciences Naturelles, No. 4, 1856.

Revue des deux Mondes, 1st January, 1857.

——— Contemporaine, 15 and 31st December, 1856.

The Natural History Review, No. 1, 1857.

The Edinburgh Review, No. 213.

The Westminster Review, No. 21, for January, 1857.

The Quarterly Review, No. 201, Ditto.

GOUR DAS BYSACK,
Librarian and Asst. Secy.

1*st April*, 1857.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1857.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 24″ East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	*Sunday.*							
2	29.903	29.987	29.850	0.137	74.5	83.6	67.2	16.4
3	.915	30.001	.845	.156	73.1	84.2	63.2	21.0
4	.914	29.989	.853	.136	75.4	86.0	68.0	18.0
5	.928	30.006	.858	.148	72.5	80.8	65.6	15.2
6	.985	.082	.926	.156	70.2	78.9	62.8	16.1
7	.977	.078	.912	.166	70.1	79.0	62.2	16.8
8	*Sunday.*							
9	.906	29.983	.856	.127	72.3	84.4	62.4	22 0
10	.956	30.043	.906	.137	73.1	82.6	65.0	17.6
11	.945	.038	.881	.157	71.6	81.1	64.4	16.7
12	.923	.021	.858	.163	69.9	79.8	62.0	17.8
13	.879	29.961	.798	.163	71.0	82.4	60.5	21.9
14	.869	.947	.807	.140	73.3	84.2	63.6	20.6
15	*Sunday.*							
16	.890	.968	.829	.139	77.9	86.0	72.0	14.0
17	.903	.985	.847	.138	77.7	87.2	71 6	15.6
18	.962	30.043	.909	.134	77.2	85.8	71.6	14.2
19	.951	.049	.862	.187	76.1	86.1	69.4	16.7
20	.902	29.995	.819	.176	75.6	86.0	66.0	20.0
21	.832	.908	.757	.151	77.2	86.0	70.8	15.2
22	*Sunday.*							
23	.774	.862	.711	.151	78.4	89.8	69.3	20.5
24	.817	.904	.760	.144	77.2	87.8	68.2	19.6
25	.805	.874	.735	.139	78.6	87.9	70.0	17.9
26	.794	.872	.727	.145	79.3	88.8	72.6	16.2
27	.775	.846	.697	.149	79.2	88.4	71.2	17.2
28	.779	.851	.711	.140	79.4	89.7	71.8	17.9

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, for the month of February, 1857.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	*Sunday.*							
2	66.4	8.1	62.3	12.2	0.565	6 16	3.02	0.67
3	65.2	7.9	61.2	11.9	.544	5.95	2.84	.68
4	69.3	6.1	66.2	9.2	.642	6.99	.44	.74
5	65.5	7.0	62.0	10.5	.559	.11	.52	.71
6	62.1	8.1	58 0	12.2	.489	5.38	.67	.67
7	61.4	8.7	57.0	13.1	.473	.20	.83	.65
8	*Sunday.*							
9	64.2	8.1	60.1	12.2	.525	.75	.83	.67
10	64.9	8.2	60.8	12.3	.537	.88	.91	.67
11	61.5	10.1	56.4	15.2	.464	.08	3.32	.61
12	60.7	9.2	56.1	13.8	.459	.05	2.93	.63
13	62 7	8 3	58.5	12 5	.498	.45	.80	.66
14	65.7	7.6	61.9	11.4	.557	6.09	.75	.69
15	*Sunday.*							
16	72.1	5.8	69.2	8.7	.708	7.67	.49	.76
17	71.9	5.8	69.0	8.7	.704	.62	.48	.75
18	70.5	6 7	67.1	10.1	.661	.17	.78	.72
19	67.9	8 2	63.8	12.3	.593	6.45	3.18	.67
20	66.9	8 7	62.5	13 1	.568	.18	.30	.65
21	69.0	8.2	64.9	12.3	.615	.69	.26	.67
22	*Sunday.*							
23	69.9	8.5	65 6	12.8	.630	.82	.49	.66
24	70.0	7.2	66.4	10.8	.646	7.01	2.94	.71
25	70.9	7.7	67.0	11.6	.659	.12	3.26	.69
26	71.9	7.4	68.2	11.1	.686	.41	.18	.70
27	72.6	6.6	69.3	9.9	.711	.67	2.89	.73
28	73 3	6.1	70.2	9 2	.732	.91	.71	.75

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1857.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Midnight.	29.896	29.984	29.773	0.211	70.8	75.3	64.0	11.3
1	.889	.990	.759	.231	70.1	74.8	63.6	11.2
2	.874	.971	.745	.226	69.7	74.0	63.7	10.3
3	.863	.959	.734	.225	69.0	73.5	62.4	11.1
4	.861	.952	.728	.224	68.4	73.2	61.6	11.6
5	.869	.968	.742	.226	68.0	73.1	61.2	11.9
6	.886	.983	.763	.220	67.5	72.6	60.6	12.0
7	.912	30.010	.800	.210	67.4	72.8	60.5	12.3
8	.939	.048	.820	.228	70.0	75.8	64.0	11.8
9	.961	.074	.844	.230	73.5	79.2	68.2	11.0
10	.971	.082	.846	.236	76.4	82.3	71.4	10.9
11	.955	.066	.839	.227	79.1	84.6	73.2	11.4
Noon.	.929	.040	.809	.231	81.5	86.9	73.8	13.1
1	.892	.003	.777	.226	83.4	88.8	76.5	12.3
2	.860	29.966	.747	.219	84.4	89.4	77.8	11.6
3	.836	.946	.705	.241	84.7	89.8	78.9	10.9
4	.826	.932	.697	.235	84.2	89.6	78.0	11.6
5	.826	.926	.702	.224	82.6	88.6	76.6	12.0
6	.833	.939	.715	.224	79.5	84.0	73.6	10.4
7	.848	.946	.726	.220	76.9	82.0	71.5	10.5
8	.869	.979	.762	.217	75.2	79.5	69.8	9.7
9	.889	.988	.784	.204	73.9	79.4	67.8	11.6
10	.900	.991	.788	.203	72.6	77.6	67.3	10.3
11	.899	.989	.786	.203	71.6	76.4	65.0	11.4

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1857.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Midnight.	66.6	4.2	64.5	6.3	0.607	6.68	1.52	0.82
1	66.2	3.9	64.2	5.9	.601	.61	.42	.82
2	66.3	3.4	64.6	5.1	.609	.71	.22	.85
3	65.8	3.2	64.2	4.8	.601	.62	.14	.85
4	65.3	3.1	63.4	5.0	.586	.46	.16	.85
5	64.8	3.2	62.9	5.1	.576	.37	.16	.85
6	64.5	3.0	62.7	4.8	.572	.33	.09	.85
7	64.2	3.2	62.3	5.1	.565	.25	.14	.85
8	65.7	4.3	63.5	6.5	.588	.46	.54	.81
9	67.6	5.9	64.6	8.9	.609	.66	2.24	.75
10	68.3	8.1	64.2	12.2	.601	.53	3.19	.67
11	68.4	10.7	63.0	16.1	.578	.24	4.29	.59
Noon.	69.1	12.4	62.9	18.6	.576	.19	5.12	.55
1	69.4	14.0	62.4	21.0	.567	.06	.90	.51
2	69.4	15.0	61.9	22.5	.557	5.94	6.37	.48
3	69.4	15.3	61.7	23.0	.554	.91	.51	.48
4	69.2	15.0	61.7	22.5	.554	.91	.33	.48
5	68.7	13.9	61 7	20.9	.554	.93	5.75	.51
6	69.0	10.5	63.7	15.8	.591	6.38	4.28	.60
7	68.3	8.6	64.0	12.9	.597	.48	3.38	.66
8	68.1	7.1	64.5	10.7	.607	.61	2.76	.71
9	67.7	6.2	64.6	9.3	.609	.66	.35	.74
10	67.2	5.4	64.5	8.1	.607	.65	.01	.77
11	67.0	4.6	64.7	6.9	.611	.70	1.70	.80

All the Hygrometrical elements are computed by the Greenwich constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1857.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches.		
1	*Sunday.*			
2	140.0	..	W. & calm & N.	Cloudless.
3	141.0	..	W. & S.	Cloudless.
4	139.9	..	S.	Cloudless till 4 A. M. cloudy till 9 A. M. Cloudless till Noon, scattered ⌒i and ⌣i afterwards.
5	129.0	..	N. W. & N.	Cloudless till 5 A. M. scattered ⌣i till Noon, cloudless afterwards.
6	133.2	..	N. & S.	Cloudless.
7	135.0	..	N. W. & N.	Cloudless.
8	*Sunday.*			
9	136.0	..	N. W. & S. W.	Cloudless.
10	141.1	..	W. & S. W.	Cloudless.
11	134.0	..	N. W. & N. & W.	Cloudless.
12	137.0	..	N. W. & S. W.	Cloudless.
13	140.0	..	W. & S. E.	Cloudless.
14	140.0	..	W.	Cloudless till Noon, scatd. ⌒i and ⌣i till 5 P. M. cloudless afterwards.
15	*Sunday.*			
16	136.1	..	S. & W.	Scattered clouds till 6 P. M. cloudless afterwards.
17	142.3	..	S.	Cloudless till 7 A. M. scattered ⌒i till 6 P. M. cloudless afterwards.
18	140.6	..	S. W. & S. & S. E.	Cloudless till Noon, scattered ⌒i till 4 P. M. cloudless afterwards.
19	141.5	..	S. W. & W.	Cloudless.
20	142.0	..	S. W. & W.	Cloudless.
21	137.9	..	S. W.	Cloudless.
22	*Sunday.*			
23	148.0	..	S. W. & S.	Cloudless.
24	138.5	..	Variable.	Cloudless.
25	139.6	..	W. & N. W.	Cloudless till 11 A. M. scattered ⌒i till 8 P. M. cloudless afterwards.
26	143.9	..	S.	Cloudless till 5 A. M. scattered ⌒i & ⌣i till 7 P. M. cloudless afterwards.
27	144.0	..	S.	Cloudless till 10 A. M. scattered ⌒i till 6 P. M. cloudless afterwards.
28	138.0	..	S.	Cloudless till 5 A. M. cloudy till 3 P. M. cloudless afterwards.

⌃i Cirri, ⌣i Cirro strati, ⌒i Cumuli, ~i Cumulo strati, ⌣i Nimbi, —i Strati, ⌃ i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1857.

Monthly Results.

	Inches.
Mean height of the Barometer for the month, ...	29.887
Max. height of the Barometer occurred at 10 A. M. on the 6th, ..	30.082
Min. height of the Barometer occurred at 4 P. M. on the 27th, ..	29.697
Extreme range of the Barometer during the month, ...	0.385

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	o
Mean Dry Bulb Thermometer for the month, ...	75.0
Max. Temperature occurred at 3 P. M. on the 23rd, ...	89.8
Min. Temperature occurred at 7 A. M. on the 13th, ...	60.5
Extreme range of the Temperature during the month, ...	29.3

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	o
Mean Wet Bulb Thermometer for the month, ...	67.3
Mean Dry Bulb Thermometer above mean Wet Bulb Thermometer, ..	7.7
Computed Mean Dew-point for the month, ...	63.4
Mean Dry Bulb Thermometer above computed mean Dew-point, ..	11.6
	Inches.
Mean Elastic force of Vapour for the month, ...	0.586

	Troy grains.
Mean Weight of Vapour for the month, ...	6.37
Additional Weight of Vapour required for complete saturation, ..	2.94
Mean degree of humidity for the month, complete saturation being unity,	0.68

	Inches.
Rained No. days, Max. fall of rain during 24 hours, ...	Nil.
Total amount of rain during the month, ...	Nil.
Prevailing direction of the Wind, ...	S. & W.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1857.

On the 7th and 23rd February, the Meteorological Observations after ten minutes intervals being taken at the Surveyor General's Office, they indicate the following circumstances.

7TH.

		h. m.	h. m.
Exact Time of	Minimum Barometer, ...	4 0 A. M. &	4 10 P. M.
Ditto	Maximum Barometer, ...	10 10 ditto &	9 50 ditto.
Ditto	Minimum Temperature,	Between 7 20 & 7 30 A. M. or half an hour after sunrise.	
Ditto	Maximum Temperature between, ..	2 50 &	3 0 P. M.

23RD.

		h. m.	h. m.
Exact Time of	Minimum Barometer, ...	4 0 A. M. &	4 0 P. M.
Ditto	Maximum Barometer, ...	10 0 ditto &	10 10 ditto.
Ditto	Minimum Temperature, ..	7 0 ditto or half an hour after sunrise.	
Ditto	Maximum Temperature,	Between 3 30 P. M. & 4 40 P. M. during which time the Thermometer was stationary.	

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1857.

Monthly Results.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour when any particular wind was blowing it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.
					No. of days.													
Midnight.	2						1		7		6		4		2		2	
1	2						1		8		5		3		3		2	
2	1								8		6		3		3		2	
3	1								9		5		3		3		2	
4	2								7		5		5		2		3	
5	2								7		5		5		1		4	
6	2		1		1		2		6		3		4		2		3	
7	4		2		1		5		4				4		3		1	
8	4		2		1		2		7		1		3		4			
9	6		1		2		2		6		1		4		2			
10	4		3		2		2		4		4		2		3			
11	4		1		1				6		3		3		5			
Noon.	2		1						5		4		4		8			
1	1						1		3		5		7		7			
2	1				1				4		5		7		6			
3	1				1		1		4		4		7		6			
4									4		3		11		6			
5	1								5		6		9		3			
6	2				1				7		5		7		2			
7	1				1				8		5		5		3		1	
8	2								8		5		5		3		1	
9	2								9		4		5		3		1	
10	3								9		4		6		2			
11	2								9		4		6		3			